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DESIGN THROUGH DRAWING:
EERO SAARINEN'S DESIGN
IN THE JEFFERSON NATIONAL EXPANSION MEMORIAL COMPETITION

RUMIKO HANDA

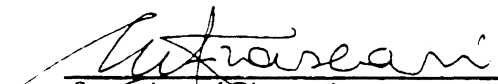
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in

Architecture

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Supervisor of Dissertation



Graduate Group Chairperson

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ABSTRACT

DESIGN THROUGH DRAWING:

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RUMIKO HANDA

MARCO FRASCARI

Drawing has the power to generate design. It is not only the depiction of an image in the architect's mind, but also, more importantly, drawing, either the act or the product, can contribute to design as a physical counterpart to architectural imagination. Many architects might agree with this proposition, based on their daily practice. This research is an attempt to cast light on this phenomenon, offering a rigorous analysis and concrete proofs. The study begins with an attempt to define architectural drawing, which leads to an extensive investigation of the characteristics of representation in architectural drawings. Eero Saarinen's winning entry in the Jefferson National Expansion Memorial Competition of 1947-48 was chosen for examination. A total of twenty-one drawings, ranging from early sketches to the four submission sheets, have survived to be studied. Contemporaneous comments by the architect and team members are also examined. With the limited interaction between the architect and client during the competition, it was possible to identify and set aside external design influences. That done, the study examines changes that occurred in the evolution of the design and traces many of them to the effects of drawing. Five ways in which drawing generates design development are proposed and related to the case. Drawing

suggests a specific way in which an ambiguous design may become more concrete. Multiple interpretation of a drawing, either conflicting with the original or not, offers a particular design development. Drawing may suggest design alternatives, sometimes by clarifying the particular problems of the design, other times by helping the architect exhaust the possibilities of design. Drawing sometimes brings an unforeseen issue to light and forces an architect to consider it. Drawing may concretize an accidental, unintended form before an architect's eyes. Seen in all its possibilities, drawing becomes more than a mere means of communication, it is a generator of creativity. Through the production of physical objects, architects are able to formulate, change, and elaborate such complex mental images as architectural designs. In the realm of architecture, imagination grows out of the experience of making.

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INTRODUCTION

Drawing is not simply the record of an architect's thoughts. Of course, drawing often serves that purpose. An architectural drawing, as a record, may serve in the designing, construction, or presentation of a building project, or may store the image of an existing building as a significant example from which to learn. However, there is more to drawing than that. Drawing can contribute to design as a generator of imagination.

The objective of this research is to demonstrate the proposition that an architectural drawing is not only the depiction of an image in the architect's mind, but also, more importantly, it is and should be seen as something that generates design. The difference is this: In the former relationship between design and drawing, the design is assumed to be envisioned before the drawing. In the latter, which I want to demonstrate, the drawing, either the act or the product, comes prior to the design. What I mean by "generating design" will become clear in the discussions to follow.

This study also attempts to chart the ways in which drawing contributes to design. The theory proposed here predicts that architectural drawing generates design in five ways, ranging from concretizing an ambiguous concept to creating new form by an accidental movement of the hand.

The drawing offers itself to an architect first as a visual object that makes manifest what he has, or he thinks he has, in mind. Even so, the

drawing, having become a physical object that exists in its own right, can achieve independence from the architect's original idea. By virtue of that independence, the drawing is open to different reactions.

I have chosen a particular design in history, Eero Saarinen's entry in the Jefferson National Expansion Memorial Competition in 1947-48, for examination. It is among the best documented of such competitions, and Saarinen's winning entry offers a distinctive design record for examination. Each of the architectural drawings produced during the design in both stages of the competition is analyzed, using all the drawings available at present.

In order to achieve the above objective, I will begin this study by attempting to define architectural drawing. In the first chapter, I will examine various drawings both within the realm of and on the verge of architectural drawing. Setting the boundary by defining architectural drawings as those which are pertinent to architectural production, I will discuss the characteristics of representation. Finally, at the end of the first chapter, five categories of ways in which drawing possibly generates design will be proposed.

The second chapter will deal with matters of method. The objectivity of research that attempts to access the mind of the architect by way of interpreting his drawings will be discussed. The broader applicability of a study which examines a single, exemplary design from history will be argued. Concerning the selection of the particular case, the historical significance of Eero Saarinen's Jefferson National Expansion Memorial Competition design will be discussed. In addition, and more importantly, the characteristics of architectural competitions will be examined to

ascertain, first, that they generally conform to the standard processes of design, and, second, that in so far as they are peculiar, competitions offer advantages for the proposed research.

The analysis of the case study will be divided into two parts, corresponding to the chronological¹ sequence of the competition's two stages. The drawings produced during the first-stage design will be examined in the third chapter, and those in the second stage in the fourth chapter. In both chapters, the possible external influences on the design will be isolated, so that the influence of the drawings themselves on the design development will be clearly seen.

This research as a whole is an attempt to make sense out of what is already intuitively perceived by an architect through his daily practice. By an expansive examination of architectural drawings in history and by a close look at the materials available in the particular case, this research hopes to make itself a rigorous study of drawing as a generator of architectural imagination.

CHAPTER I

REPRESENTATION: DESIGN THROUGH DRAWING

Definition of Architectural Drawing

I shall begin this chapter by defining what I mean by architectural drawings. A definition is necessary, for it determines the boundaries of this investigation. To give the conclusion first: if a drawing is created for the production of architecture, then I include that drawing as the subject matter of this discussion. No matter what the type of drawing, whether perspective or orthogonal, no matter what the technique, whether the object of the drawing is an existing building or a future project, whether the primary objective of a drawing is to communicate the design, or to record an existing building from which to learn for future design—if the drawing is generated with the production of architecture in mind, then I include it as a subject of consideration.

Definition by Object of Depiction

It is not possible to define architectural drawings by the objects they depict. In other words, it is not always the case that a drawing of architecture is an architectural drawing. Some drawings of architecture fall into the category of painting. On the other hand, the object that an architectural drawing depicts is not always identifiable as architecture.

An example of drawings which depict architecture but are not necessarily architectural drawings is Claude Monet's series of paintings of Rouen Cathedral, which began in 1892. Although the subject matter is, as the title makes clear, a building, it is not reasonable to treat the result as an architectural drawing. The building was treated as something that already existed in front of the artist's eyes, to be viewed and drawn. The artist's attention was devoted to the visual effect of the scene and how he could represent it as a painting.

In order to clarify the definition, one should consider the fact that there are two lives, so to speak, in a drawing. One occurs as it is drawn, the other after it is completed. Although Monet's painting was not drawn with architectural production in mind, it may be interpreted, say by an architect, so that the interpretation works to influence a production of architecture. I shall exclude such a case from architectural drawing for the following reasons. Firstly, the thesis of this research is meaningful only when there is an idea, however ambiguous it may be, before drawing, to compare with the idea generated by the drawing. Secondly, any object can possibly give an architect an idea for his design. If Monet's painting were considered an architectural drawing because it possibly influences an architectural production, then any object would have the potential to be architectural for the same reason. For these two reasons, architectural drawings are limited here to those pertaining to production of architecture at the time of their creation.

One might say that in a case like Monet's, the subject matter of the paintings is an existing building, and it may seem that one can successfully

define architectural drawings by subjects through limiting the subjects to projects yet to be built. There is, as Gavin Stamp pointed out in his discussion of architectural drawings done in Britain between 1770 and 1940, a vital distinction between a drawing “made in advance of the executed structure” and a “topographical drawing,” or “representation of a building which already exists.”¹

However, the question of whether or not the building already exists is not in itself the way to distinguish architectural drawings from, say, paintings of architecture. The following examples will indicate the contrary, suggesting that some drawings of existing buildings should be included in the category of architectural drawing.

Architects throughout history have drawn existing buildings in order to make a record of distinctive buildings and to use the drawings as a manual and a source of future designs. An example is the sketchbook of Villard de Honnecourt, who drew ground floor plans and elevations of Gothic buildings, ornaments, furniture, and machinery, as well as human and animal figures in the thirteenth century (fig. 1).² The written text on figure 1 indicates that this drawing of an existing building was presented as a reference for a future project:

This is a clock-house. He who wishes to make a clock-house may see here one that I once saw. The first and lowest story is square with gables; the story above has eight sides, then comes a roof, and then [come] four gablets [and] between [every] two gablets [is] an empty

¹Gavin Stamp, Great Perspectivists (New York: Rizzoli, 1982), p. 9.

²Theodore Bowie, The Sketchbook of Villard de Honnecourt (Bloomington: Indiana University, 1959).

space; the highest story is square, with four gables and the roof is eight sides. Here is the drawing.³ (Brackets Holt's)

More recent examples are travel sketches by Louis I. Kahn. Kahn believed that there exists a point of view specific to architects:

To an architect the whole world exists in his realm of architecture ... All the activities of man are in his realm, relating themselves to his own activity.⁴

Therefore, when Kahn drew existing architecture such as Albi (fig. 2) and Carcassonne, he confronted them with a certain point of view particular to architects. Kahn drew Albi from the bottom up, feeling the excitement that he imagined the workmen had had during construction.

In the presence of Albi, I felt the belief in the choice of its architectural elements, and what exhilaration and patience were combined to begin it and work towards its completion. I drew Albi from the bottom up as though I were building it.⁵

At Carcassonne, he drew the existing buildings, not as they actually were, nor as they looked to him, but in the way he wanted them to be.

I began studiously to memorize in line the proportions and the living details of these great buildings. I spent the whole day in the courts, on the ramparts, and in the towers, diminishing my care about the proper proportions and exact details. At the close of the day I was inventing shapes and placing buildings in different relationships than they were.⁶

³Elizabeth G. Holt, *A Dictionary History of Art* (Princeton: Princeton University Press, 1947; Garden City, NY: Doubleday Anchor Books, 1957), vol. I, p. 90.

⁴Louis I. Kahn, *Drawings* (New York: Access Press, 1981), no page number.

⁵Ibid.

⁶Ibid.

In drawing an existing building, therefore, the architect imagined himself to be preparing for a later project, regardless of whether there was any concrete possibility of doing so.

Some of Kahn's travel sketches of the pyramids of Egypt (fig. 3) actually became a basis for projects of his a few years later, as traced by Vincent Scully:

In the pyramids Kahn finds the first architectural form that he can make wholly his own and upon which he can begin to base his Order. So, it appears not only as tetrahedron in the slab of his Yale Art Gallery of 1951-53 but also as the roof shape in his Trenton Bath House of 1955.⁷

Le Corbusier also clearly recognized that the architect draws visual objects that he encounters in travel in order "first to look, and then to observe and finally perhaps to discover":

When one travels and works with visual things—architecture, painting or sculpture—one uses one's eyes and *draws*, so as to fix deep down in one's experience what is seen. Once the impression has been recorded by the pencil, it stays for good, entered, registered, inscribed. The camera is a tool for idlers, who use a machine to do their *seeing* for them. To draw oneself, to trace the lines, handle the volumes, organize the surface ... all this means first to look, and then to observe and finally perhaps to discover ... and it is then that inspiration may come. Inventing, creating, one's whole being is drawn into action, and it is this action which counts.⁸

⁷Vincent Scully, "Introduction," The Travel Sketches of Louis Kahn (Philadelphia: Pennsylvania Academy of the Fine Arts, 1978), p. 20.

⁸Le Corbusier, Creation Is a Patient Search, trans. James Palmes (New York: Frederick A. Praeger, 1960), p. 37. For Le Corbusier's travel sketches, see Le Corbusier (Charles-Edouard Jeanneret), Journey to the East, ed. and trans. Ivan Zaknic (Cambridge and London: The MIT Press, 1987), originally published Le Voyage d'Orient (Paris: Forces Vives, 1966), and idem, Voyage d'Orient Sketchbooks (New York: Rizzoli; Milano: Electa, 1988).

Although Le Corbusier's travel sketches, such as figure 4, show existing buildings, they have to be considered architectural drawings in that they contributed to the production of future architecture by allowing the person who drew them to formulate meaningful encounters with the buildings.

Sometimes architectural drawings provide the only opportunity for the architect to envisage an image. In such cases, the subject of the drawing is neither a building that is expected to be built nor an existing building. Visionary architects such as Etienne-Louis Boullée drew architecture with sublime beauty (fig. 5). In this case, the buildings depicted are not projects conceived for construction in the near or distant future. Instead,

Drawings largely took the place of executed designs, since for him it was vision which counted.⁹

This notion is clearly stated in the first paragraphs of Boullée's Architecture, Essay on Art.

What is architecture? Shall I join Vitruvius in defining it as the art of building? Indeed, no, for there is a flagrant error in this definition. Vitruvius mistakes the effect for the cause. In order to execute, it is first necessary to conceive. ... It is this product of the mind, this process of creation, that constitutes architecture and which can consequently be defined as the art of designing and bringing to perfection any building whatsoever. Thus, the art of construction is merely an auxiliary art ...¹⁰

In a visionary drawing like Boullée's, the architect does not necessarily expect a realization of the design. In fact, for Boullée, "the tinted drawing

⁹Helen Rosenau, Boullée and Visionary Architecture (London and New York: Academy Editions and Harmony Books, 1976), p. 10.

¹⁰Etienne-Louis Boullée, "Architecture, Essay on Art," trans. Helen Rosenau, in Boullée and Visionary Architecture, p. 83.

was the artistic creation.”¹¹ Although the subject of drawing is not a project to be built, one must consider it an architectural drawing in that the drawing was for the architect nothing more or less than the production of architecture.

When one encounters something like the studies by Daniel Libeskind as a type of architectural drawing, one faces a case that is almost too removed from the usual definition of architectural drawing (fig. 6). What is portrayed is not anything that is conventionally considered a building or a room within a building. It is much more fragmentary and non-descriptive. The drawings do not help deal with a specific building project in planning, in execution, or illustration, nor are they meant to be future reference for a project. The drawings were an investigation of “the situated meaning and the meaning of our situation in architecture.”¹²

Libeskind defines as problem-solving operations the contemporary situation of architecture and architectural education, originally institutionalized by J.-N.-L. Durand and the Ecole Polytechnique. He compares them to a laboratory experiment that

reflects the general secularization of culture, whose symptoms include the relativization of meaning, the devaluation of tradition and the virulent attack on all forms of symbolic, emblematic and mythical experience.¹³

¹¹Helen Rosenau, Boullée, p. 10.

¹²Daniel Libeskind, “Symbol and Interpretation,” in Between Zero and Infinity: Selected Projects in Architecture (New York: Rizzoli, 1981), p. 27.

¹³Ibid.

Libeskind considers himself midway between the claim that "the 'natural' development of Architecture depends on the appropriation and ultimate domination of technique, inevitably leading to the objectification and quantification--the consumption of the space of encounters," and the view of architecture as "an autonomous and self-referential discipline, inventing its own tradition through mute monuments." He attempts to "deal with the poetic complexity of Architecture in time."¹⁴ For Libeskind:

An architectural drawing is as much a prospective unfolding of future possibilities as it is a recovery of a particular history to whose intentions it testifies and whose limits it always challenges. In any case a drawing is more than the shadow of an object, more than a pile of lines, more than a resignation to the inertia of convention.¹⁵

Thus for Libeskind, architectural drawings do not necessarily describe a specific building of the future or the present, nor do they depict a utopian or illusionary image. Yet his drawings should be classified as architectural drawing because they are meant to address critically the issues of the contemporary state of architecture.

Definition by the Type of Drawings

Leon Battista Alberti recognized the distinction between paintings of buildings and architectural drawings. In the depiction of buildings,

¹⁴Ibid., p. 29.

¹⁵Idem, "End Space," in Between Zero and Infinity, p. 60.

according to Alberti, an architect provides accurate measurements, whereas a painter tries to achieve an appearance:¹⁶

The difference between the drawings of the painter and those of the architect is this: the former takes pains to emphasize the relief of objects in paintings with shading and diminishing lines and angles; the architect rejects shading, but takes his projections from the ground plan and, without altering the lines and by maintaining the true angles, reveals the extent and shape of each elevation and side—he is one who desires his work to be judged not by deceptive appearances but according to certain calculated standards.¹⁷

Based on this understanding, Alberti distinguished architectural drawings from paintings by the type of projection used to construct the drawing. He assigned ground floor plans and models to the architect, and perspectives to the painter.

For this reason I will always commend the time-honored custom, practiced by the best builders, of preparing not only drawings and sketches but also models of wood or any other material.¹⁸

After Alberti, Raphael Sanzio, working as a chief architect in charge of St. Peter's, prescribed in his letter of 1519 to Pope Leo X that architectural drawings should be in plan, section, and elevation.

And because the method of drawing that belongs more to the architect differs from that of the painter, I shall state what seems to me appropriate to understand all the measurements and to know how to find all the parts of a

¹⁶Wolfgang Lotz, Studies in Italian Renaissance Architecture (Cambridge and London: The MIT Press, 1977; paperback edition, 1981), p. 4.

¹⁷Leon Battista Alberti, On the Art of Building in Ten Books, trans. Joseph Rykwert, Neil Leach, Robert Tavernor (Cambridge and London: The MIT Press, 1988), p. 34.

¹⁸*Ibid.*, pp. 33-34.

building without error. The drawing of buildings, so far as the architect is concerned, therefore should be divided into three parts of which the first is the plan, or rather the ground plan, the second deals with the exterior ... the third, with the interior.¹⁹

It is not possible to apply this distinction based on the type of projection to all architectural drawings, nor to every period of history or every region.²⁰ Alberti's statement reflects only his own theory that the truth of architecture lies in proportions and principal measurements.

There are in fact architectural drawings created not far from Alberti in time and place that portrayed their subject as a body of spatial volume with effects of light and shadow. Such are the perspective drawings of Tempietto at San Pietro in Montorio (fig. 7), and of the Pantheon in Codex Coner (fig. 8), a collection of drawings published and attributed to Donato Bramante's Roman school by Thomas Ashby. In such cases, the drawings were constructed by perspective projection.

Classification of Architectural Drawings by Sequence

Having failed to define "architectural" drawings by either the object of depiction or the type of drawing, it is easier, instead of defining them, to classify architectural drawings by the different purposes that they serve according to the phase in the sequence of design in which they appear.

¹⁹Lotz, pp. 20-21, and note no. 52, p. 36.

²⁰Ibid., p. 13.

Architectural drawings can thus be classified as referential sketches, initial sketches, study drawings, presentation drawings, and construction drawings.

Wolfgang Iotz, in his study of the rendering of interiors in the Renaissance, excluded three drawings from the category of architectural drawings: Pisanello's drawing of an interior (fig. 9), which is now located in the Louvre, and Filippo Brunelleschi's two famous lost drawings of the Palazzo Signoria and of the Baptistry of Sta. Maria del Fiore. He excluded them, but not because they do not depict buildings, existing or projected. In fact, all three depict an imaginary interior space or an existing building. Neither were they excluded because the way in which they were drawn falls into the perspective projection.

The reason Pisanello's drawing was not considered an architectural drawing was that it did not limit the boundary of the room but continued it to infinity, and kept the building as skeletal outlines of columns, beams, and vaults while shading human figures. By treating the space in such ways, the artist used the interior simply as a spatial frame in which to set the human figures that form the subject of the drawing.²¹

In the case of Brunelleschi's perspectives, they were not architectural drawings because:

they did not serve in the planning, the execution, or the illustration of a building project, nor was it Brunelleschi's intention to represent these buildings for their own sake, as examples of outstanding architecture.²²

²¹Ibid., p. 6.

²²Ibid., p. 4.

This is in fact a counter-definition of architectural drawings that Lotz used to exclude the drawings by Pisanello and Brunelleschi. The unstated proposition is that architectural drawings are those which serve in the planning, the execution, or the illustration of a building project, or which represent existing buildings as examples of outstanding architecture from which to learn. As a definition, this does not capture architectural drawing in a singular manner and only classifies what architectural drawings can be. Nevertheless, it seems to work not only for the drawings of the Renaissance but throughout history and regardless of region.

Lotz recognized that there are distinguishable purposes for architectural drawings. In labeling drawings by their position in the design process, he framed the issue in question as the purpose of architectural drawing. It is not only Lotz who tries to understand architectural drawings by defining their distinct purposes in several stages of architectural production. Neil Levine recognized that the drawings produced for the Ecole des Beaux-Arts Grand Prix have two distinctive sets of purposes. Michael Graves classified his architectural drawings by sequence and by three different purposes they serve.

Beaux-Arts Grand Prix Drawings

In his examination of the 1824 Grand Prix competition at the Ecole des Beaux-Arts, Neil Levine divided the design process into two distinctive

stages: the esquisse and the rendu.²³ Levine found a distinctive difference between the criteria for judgment between the first and second stages.

During the long history of the Ecole des Beaux-Arts in Paris, the competition of the Grand Prix was kept as a two-stage affair until 1864,²⁴ when the two became independent competitions with different programs.²⁵ The first stage, held for twenty-four hours, involved eligible students who had notified the authorities of their intention to enter; this stage required a plan in scale of 1:100, section and elevation in 1:50, and sometimes a site plan. The drawings were done in ink, not on tracing paper but on watercolor paper, and normally finished with light washes of gray, pink, green or brown. The second stage allowed the eight finalists to compete over the next four months, and also required plans, sections and elevations, but this time in scales more than twice those of the first stage.

In the Grand Prix competition of 1824, as the result of the first-stage judgment, Henri Labrouste was among the eight logistes, or the finalists, with a scheme the least favored by the jury. Yet he won the Grand Prix in the final stage. The reason why Labrouste could reverse the order of preference from the first stage, according to Levine, was that the jury's criteria for judgment were different in the first and the second stages.

In the first stage,

²³Neil Levine, "The Competition for the Grand Prix in 1824: A Case Study in Architectural Education at the Ecole des Beaux-Arts," in Middleton, Robin, ed., The Beaux-Arts and Nineteenth-Century French Architecture (Cambridge: The MIT Press, 1982), pp. 66ff.

²⁴Ibid., p. 68

²⁵Ibid., p. 99.

The twenty-four hour sketch tested the student's intelligence in analyzing the programme and his clarity of purpose in defining a general solution. The problem was to distinguish the significant elements, decide on a *parti*, or scheme of organization, and then compose the elements into an appropriate form.²⁶

The Académie was said to have made its decisions "on a strictly comparative basis by weighing the compositional variations on a few standard types of *parti*."²⁷ The "jury first divided the projects into groups by type and then chose the best version of the most promising variations of each."²⁸ Then "the Académie looked for clarity and decisiveness of intellectual perception in distinguishing the best examples of each *parti*. The first version of each is the purest and clearest representation of its type."²⁹

By comparison, the second-stage rendering was considered in terms of "the expression of character," "proportions and decoration," and "the individual power of expression."³⁰

The overall plan of the winning project always presented the strongest visual image in terms of graphic design. ... the qualities of refined proportions, decorative imagination, thematic coherence and elegant finish were best seen in the elevation and sections.³¹

²⁶Ibid., p. 83

²⁷Ibid., p. 95.

²⁸Ibid., p. 95.

²⁹Ibid., p. 98

³⁰Ibid., p. 119.

³¹Ibid.

This difference in the objectives of the two stages was recognized not only by the teachers and academicians who judged the competition but also by the students themselves. The scales and the types of projection were determined by the jury and prescribed in the program. However, there are additional characteristics of the first-stage drawings which suggest that the students tried to present the parti clearly while suppressing the other features of the design, which would then be the concerns in the second stage.

The student might prudently leave certain areas in his sketch vague or incomplete, or he might even cavalierly indicate alternative solutions.³²

Labrouste's sketches of 1824 (fig. 10) were not precise:

The lateral porticoes of the front courtyards are seventeen columns deep, an anomaly only barely tolerated when the odd column was not lined up with an opening as it is here. More obvious is the fact that the section does not exactly correspond to the plan and was not drawn to the proper scale.³³

One may, as Levine did, regard these as Labrouste's mistakes, instead of intentional vagueness in depiction or alternative designs.³⁴ However, these "mistakes" did not become an issue in the esquisse stage, for what was drawn wrong was not examined. For example, the number of columns did not matter in the first stage but that it was a colonnade did.

³²*Ibid.*, p. 101.

³³*Ibid.*, p. 98.

³⁴*Ibid.*, p. 102.

In the Grand Prix of 1821, Abel Blouet, whose sketch placed him first, took advantage of the fact that his design was symmetrical and offered two alternative designs in plan as well as elevation, differentiating the left and the right halves of the drawing (see figs. 11 and 12). Henri Labrouste, in his third-place sketch in the same year, depicted the form of the ceiling of the central room differently in plan and in section (fig. 13).³⁵ The floor plan included the reflected ceiling plan of three domes, whereas the section depicted vaulted ceilings instead.

The fact that there were ways of drawing that made drawings address the parti more than other aspects of design suggests that it was not that the jurors were pre-determined to use different criteria in looking at the drawings. Instead, the drawings themselves were different in their representations because of their own qualities.

Categorization by Design Sequence

According to Michael Graves, an architectural drawing can be categorized as a referential sketch, preparatory study, or definitive drawing, although he does not identify types of drawing techniques used specifically within each category.

Like the physical artifact collected or admired as a model holding some symbolic importance the referential sketch is a metaphorical base which may be used, transformed, or otherwise engaged in a later composition.³⁶

³⁵Ibid., p. 101.

³⁶Michael Graves, "The Necessity for Drawing: Tangible Speculation," Architectural Design 6 (1977).

According to Graves, the significance of the referential sketch lies in increasing the possibility that the architect may form a meaningful interpretation and preserve it for future reference.

The preparatory study addresses itself to certain questions about specific parts or aspects of the design. It is experimental and proceeds to more concrete ends. "Generally didactic in nature, these studies instruct as much by what is left out as by what is drawn."³⁷

Finally, the definitive drawing is "an instrument to answer questions rather than to pose them."³⁸ Being quantifiable, it is the last step toward the built reality.

By using the distinctions offered by Lotz, Levine, and Graves, we may be able to divide architectural drawings into five categories, though not exclusive of each other, by the sequence of design. These categories are: referential sketches, which include travel sketches, initial sketches, study drawings, presentation drawings, and construction drawings. Travel sketches are included in referential sketches for they are drawn with the possibility in mind that they will be referred to in a future project. Although the purpose of each type of drawing and its location in the sequence of design is distinct, it does not, as Graves pointed out, mean that a drawing classified as, for example, a presentation drawing, has none of traits of the other categories. Any drawing can have some or all five natures within itself.

³⁷Ibid.

³⁸Ibid.

The Need to Draw in Architectural Production

It is not satisfying to define architectural drawings by using a set of definitions. Instead, one should come up with an overall definition that works for any of the five categories. In order to do so, I would like to offer as a definition that an architectural drawing is one created particularly for architectural production. Architectural production here includes, using Lotz's classification again, planning, illustrating, executing, and learning from existing building.

A question arises here of whether architectural production is possible without drawing. This may be answered by examining the history of architectural production in various regions. However, in order to consider this question, the following two issues must be clearly separated. First is the question of whether men knew how to represent architecture in the form of drawing; this has been answered affirmatively by the surviving drawings. To give some examples, a drawing from Ancient Egypt (fig. 14) on papyrus shows the side elevation of the front of a building, and another drawing from a tomb of a priest depicts a royal building and its usage (fig. 15).³⁹

The second issue, whether these drawings were in fact used to produce architecture, is of more importance here.⁴⁰ The two examples at hand cannot be automatically taken as proof that drawings were used for

³⁹Spiro Kostof, ed., The Architect: Chapters in the History of the Profession (New York: Oxford Univ. Press, 1977), pp. 8-9.

⁴⁰For discussions on drawings in Ancient Greece, J.A. Bundgaard, Mnesicles: A Greek Architect at Work (Gyldendal, Kobenhavn: Scandinavian University Books, 1957) and J. J. Coulton, Ancient Greek Architects at Work: Problems of Structure and Design (Ithaca: Cornell University Press, 1977).

producing architecture. While the purpose of the side elevation is unclear, the tomb drawing was evidently not used for production of architecture but was a depiction after the building was completed. It is even less possible to assert that drawing is totally necessary for any type of architectural production, or to state that architecture can in any way be produced without drawing.

Even though one cannot conclude that architectural production is impossible without drawing, it is at the same time difficult to imagine a whole architectural production without any drawings at all. Given the tasks architectural drawings perform during architectural production, it is reasonable to assume that at least some drawings have to be created. However, it is not possible, nor is it the objective of my research, to prove this. This can only be supported by the numerous statements of architects that imply the necessity of drawing. To give one example, Carlo Scarpa wrote:

I want to see things, I don't trust anything else. I place things in front of me on the paper so that I can see them. I want to see therefore I draw. I can see an image only if I draw it.⁴¹

Nature of Representation in Architectural Drawings

As is clear from the definition of architectural drawings established above, this research is meant to include all kinds of architectural drawings,

⁴¹Richard Murphy, Carlo Scarpa and the Castelvécchio (London and Boston: Butterworth Architecture, 1990), p. 12.

referential sketches, initial sketches, study drawings, presentation drawings, or construction drawings, so far as they are created with architectural production in mind.

Having defined architectural drawings as the ones pertinent to architectural production, one can accordingly proceed to consider the nature of representation in architectural drawings.

Representation in Architectural Drawing

The most important characteristic of representation specific to architectural drawings is that, instead of reflecting something that already exists in front of the viewer, the representation in architectural drawing is the first visual object that is physically present before the eyes. I use "physically" in order to distinguish it from a mental image that may be considered "present" in the mind. Considering that there are many cases in which "what they represent is itself present"⁴² physically, the fact that the architectural drawing is the first visual object physically present is a peculiar phenomenon.

Even when facing an existing building, the architect is concerned not only with depicting the building as it is, but with making his own interpretation of it. The act of drawing helps him form this, and the product is therefore the first real object that makes his particular interpretation physically present for him visually.

⁴²Hans-Georg Gadamer, Truth and Method, second ed. trans. revised Joel Weinsheimer and Donald G. Marshall (New York: Crossroad, 1989), originally published Wahrheit und Methode (Tubingen, 1960), p. 154

The significance of an architectural drawing lies in the fact that it is visually and physically present, unlike the building as it will exist, will be perceived, or ought to be perceived, in a particular way. Representation is therefore not reproduction, not a copy. Here the "re-" of representation does not simply mean doing something again.

Vitruvius Pollio recognized the relationship between representation and what is represented in architecture:

Both in general and especially in architecture are these two things found; that which signifies and that which is signified. That which is signified is the thing proposed about which we speak; that which signifies is the demonstration unfolded in systems of precepts.⁴³

Vitruvius then emphasized the importance of the architect's ability to imagine a building before the actual construction.

There is this difference between the architect and the layman, that the layman cannot understand what is in hand unless he sees it already done; the architect, when once he has formed his plan, has a definite idea how it will turn out in respect to grace, convenience, and propriety.⁴⁴

The distinction between present and absent has often been confused with the difference between existing and non-existing. When Charles Sanders Peirce defined a "sign" as "something that stands for something

⁴³Frank Granger, ed. and trans., *Vitruvius: On Architecture* (Cambridge: Harvard University Press; London: William Heinemann, Ltd. 1962), vol. I, p. 7.

⁴⁴*Ibid.*, vol. II, p. 59. Haec autem recte constituuntur, cum is et a fabris et ab idiotis patitur accipere se consilia. Namque omnes homines, non solum architecti, quod est bonum, possunt probare, sed inter idiotas et eos hoc est discrimen, quod idiota, nisi factum viderit, non potest scire, quid sit futurum, architectus autem, potest scire, simul animo constituit, antequam inceperit, et venustate et usu et decore quale sit futurum, habet definitum.

else," he did not specify the condition of "something else."⁴⁵ However, one should recognize the differences among the following three: The first condition, being present, is when it existed at that moment and in that place; the second, being absent but existing, is when it existed somewhere else at that moment; and the third and last, being non-existing, is when it did not exist at that moment nor in that place. The case of architectural drawings involves the last of the three.

To accept that architectural drawing is peculiar because what is signified does not exist at the time the sign is produced, one has only to consider a traffic sign, whose primary function is to warn that something is coming ahead. A curving road, for example, which is indicated by the traffic sign, exists already, but is absent from the place where the sign is. The representation in architectural drawings deals with something that is neither existing nor present. Therefore, the significance of the architectural drawings is that they themselves are the first objects that physically exist and are present in front of the architects' eyes.

Vision and Representation

Vision possesses a quality that makes it seem the same or very similar to the object itself.⁴⁶ Since architectural drawings are visual objects, one tends to accept what one sees in an architectural drawing as something that actually is or will be in reality. However, it should be stressed that the

⁴⁵Justus Buchler, ed., *Philosophical Writings of Peirce* (New York: Dover Publications, Inc., 1955), p. 99.

⁴⁶Hans Jonas, *The Phenomenon of Life: Toward a Philosophical Biology* (Boston: Boston Book and Art Shop, 1967), pp. 135-156.

drawing is nothing but a plan for what the architect wants the building to be or appear.

Abstraction by Architectural Drawings

As Arthur Drexler showed, it is crucial in discussing representation in model-making or drawing to distinguish whether an architectural drawing is "meant to describe a building as it actually will be; as it will be perceived; or as it ought to be perceived."⁴⁷ Architectural drawings only depict a certain aspect of the building's reality, not all points of view. On the other hand, for example, certain nineteenth-century English perspective drawings show too fancy and impossible surroundings and backgrounds, and one may say that drawings sometimes go beyond reality by portraying the buildings as the architect wishes them to be perceived.⁴⁸

This is the reason why "representation," not "presentation," is appropriate in discussions of architectural drawings. One should understand that the "re-" of "representation" suggests that there is a difference between the representation and what is represented.

Exactly what aspect of reality an architectural drawing depicts is dependent on, inter alia, the type of projection, the scale, or the type of strokes used to produce the drawing.

⁴⁷Arthur Drexler, "Engineer's Architecture: Truth and its Consequences," in Drexler, ed., The Architecture of the Ecole des Beaux-Arts (New York: The Museum of Modern Art, 1977), p. 21.

⁴⁸Stamp, Great Perspectivists, pp. 7-22. This includes the contemporary architects' comments on picturesque perspectives, in which they argued that the architectural drawings should never lie, but be a truthful presentation of the reality. I would like to extend the objectives of these perspectives to include a case in which they depicted the surroundings of the buildings as they wished them to be.

Scale, Degree of Abstraction

Some design features can be kept ambiguous when the drawing is done in small scale. At a large scale, it is difficult for the overall relationships, or the composition, to be read. An example is the set of drawings that Levine observed from the 1824 Grand Prix of the Ecole des Beaux-Arts. The esquisses are at a small scale, whereas the re-~~tu~~ are at a scale two to ten times bigger. The bigger the scale, the more attention is addressed to the details. The smaller the scale, the stronger prevails the overall composition.

Projection

Orthogonal projection includes plan, section, and elevation. These renderings were prescribed by Raphael to be the appropriate drawings of the architects, and this notion was realized in the publication of Quattro Libri by Andrea Palladio in 1570.⁴⁹ Orthogonal projections are produced by projecting a three-dimensional figure on a two-dimensional plane, horizontally situated in the case of plan and vertically located in the case of section or elevation, with the projection lines parallel to each other and perpendicular to the projection plane (fig. 16).

As Alberti described in ground plans, orthogonal projections maintain true measurements between two points as long as the line between the two runs parallel to the projection plane.

⁴⁹Yve-Alain Bois, "Metamorphosis of Axonometry," in Daidalos, no. 1 (1981), p. 49.

Perspective projection, a two-dimensional image produced by intersecting the lines between the viewpoint and the object through a picture plane, depicts a building close to that visually perceived from the viewpoint (fig. 17).

Axonometric or isometric projection keeps the measurements true in a manner similar to orthogonal projection. But in contrast to orthogonal projections, which require a number of constructions to depict all three directions—width, length, and height—these two projections represent three dimensionality in a single construction of drawing. In order to achieve the same effects, the orthogonal projections have to be connected to each other in a geometrical way, as “suggested by [Albrecht] Dürer and developed by [Sebastiano] Serlio in his *Primo Libro*.”⁵⁰

Because axonometric and isometric constructions are based on orthogonal projections, constructing these projections saves drawing time and requires less training, once the architect establishes the plan, section, and elevation. Jules de la Gourneire, professor of bridge and road construction at the Ecole Polytechnique in Paris in the nineteenth century, rightly named axonometric drawing “fast perspective.”⁵¹

However, these drawings do not describe the object as it is visually perceived (fig. 18). The only way to specify the viewpoint is by choosing the direction. The choices are limited to either a “bird’s eye” or a “frog’s eye” view, and determining the angle of the projecting lines to the frontal plane of the object, which is usually either 30 or 45 degrees. As a result, the

⁵⁰Ibid., p. 49.

⁵¹Ibid., p. 56.

drawings are unreal, or do not correspond well with the vision, and “give rise to often conflicting interpretations.”⁵²

An achievement of axonometric and isometric projections is, as Yve-Alain Bois pointed out, that they keep the infinite end of the space as the geometrically infinite in the drawing.⁵³ The significance of this is understood once these projections are compared with the perspective drawings of the Renaissance, in which the end of the space existed as a finite object, that is, the vanishing point. The existence of the infinite end on the paper did not correspond with the idea that infinity has to do only with God.

Media of Drawing

The drawing media are related to the strokes, for certain kinds of paper and drawing materials tend to create particular friction, influencing the movements of the hand. It is not possible in this study to review extensively drawing techniques and media. To give a few other examples, however, the use of technical pens promoted hard line drawings that outlined objects (fig. 19).⁵⁴ Tracing paper makes it easy to design by layering drawings one atop another. Carlo Scarpa’s use of print is another way of designing by layers. He printed the existing conditions or the part of his design already fixed, and then worked with pencil and colored pencil on a

⁵²Ibid., p. 42.

⁵³Ibid., p. 46.

⁵⁴Leatherbarrow and Powell, Masterpieces of Architectural Drawing (London: Orbis, 1982), p. 41.

new portion of the design.⁵⁵ Louis I. Kahn is said to have placed a yellow tracing paper over the drawings constructed by his office staff. He then drew in bold strokes with charcoal.⁵⁶ Michael Graves reports that he has encountered a theory that the conceptual transparency of some modern buildings is at least partly due to the use of tracing paper during design that enabled successive reworkings of the basic themes. Graves states:

The accuracy of this assertion is slightly beside the point. However, it is true that the difference between working on opaque and transparent surfaces will ultimately affect the understanding and conceptualization of any composition.⁵⁷

Representation by Models

Models are another means of representation during architectural production. The most noticeable difference between the two media is their dimensionality. Whereas a drawing is a two-dimensional representation, a model keeps the three-dimensionality of the object represented.⁵⁸ In this way, it may be said to be a closer representation than a drawing. Alberti recommended architects to prepare models "of wood or any other material" in order to "weigh up repeatedly and examine, with the advice of experts, the work as a whole and the individual dimensions of all the parts, and,

⁵⁵Murphy, pp. 12-13.

⁵⁶Marshall D. Meyers, "Louis Kahn and the Act of Drawing: Some Recollections," in Louis I. Kahn: Sketches for the Kimbell Art Museum (Fort Worth, TX: Kimbell Art Museum, 1978), no page number.

⁵⁷Graves, "Necessity."

⁵⁸James H. Bunn, The Dimensionality of Signs, Tools, and Models (Bloomington: Indiana University Press, 1981), Introduction.

before continuing any farther, to estimate the likely trouble and expense.”⁵⁹ Michelangelo Buonarroti made a life-size model of the cornice of Palazzo Farnese and placed it in the exact location on the existing building to which it was to be attached, in order to gain the approval of the client.⁶⁰

However, it is important to recognize that a representation that is closer to reality is not necessarily a better representation.⁶¹ By being closer to reality, the model runs the risk of becoming imprecise about specifying the way of looking at the object. The model does not, for example, specify the viewpoint from which the building is supposed to be seen, or is best seen, by the viewer.

Another price of three-dimensionality is that the modeling materials assert themselves in representation. When the drawing stays two-dimensional, the materials, such as paper and the drafting pen, only work to create a certain quality of lines, but never pronounce their materials as being the ones of the building in reality. Even when colored pencils are used, as they were by Scarpa, the drawing materials are not taken as the building materials (fig. 20). However, when it comes to the modeling materials, it becomes rather difficult to distinguish the abstractness of them from the reality of construction materials. In other words, when the model is made

⁵⁹Alberti, p. 34.

⁶⁰Giorgio Vasari, *The Lives of the Artists*, a selection translated by George Bull (Harmondsworth, Middlesex, England: Penguin Books, 1965).

⁶¹For the discussion of some examples comparing drawings and models, refer to Drexler, “Engineer’s Architecture: Truth and its Consequences,” *Ecole des Beaux-Arts*, pp. 21-27.

of wood, for example, there is a possibility that wood will be taken as the construction material of the building represented.⁶²

Another difference between models and drawings is in the relationship between the product and process. Whereas drawing is a precise tracing of the movement of the hand, cutting and pasting do not by themselves give form to the model. Clay is probably the only material that achieves a close relationship between the movement of the hand and the product.

Although some of the findings of this research may be applicable to models, it is clear at least that model-making and drawing are distinctively different.

Sign or Symbol

It seems easily accepted about model-making and drawing that "both modes of projecting architectural form are supposed to refer to something other than themselves."⁶³ Charles Sanders Peirce described representation as follows:

A sign, or *representamen*, is something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the *interpretant* of the first sign. The sign stands for something, its *object*. It stands for that object, not in all respects, but in reference

⁶²Kahn deliberately chose basswood, according to Meyers, because of its quiet and indistinct grain pattern.

⁶³*Ibid.*, p. 21.

to a sort of idea, which I have sometimes called the *ground* of the representamen.⁶⁴

In this phenomenon of referring-to or standing-for, which seems a matter of course at first, Hans-Georg Gadamer found a number of distinguishable functions. Examination of architectural drawing against these functions will be a way to identify in detail the characteristics of its representation.

Gadamer finds two extremes in representation, namely, Verweisung and Vertreten. Verweisung, or “pure indication,” is the “essence of the sign,” while Vertreten, or “pure substitution,” is the “essence of the symbol.”⁶⁵ The natures of representation by Verweisung and Vertreten are described further as the following. Concerning Verweisung,

... a sign is nothing but what its function requires; and that is to point away from itself. In order to fulfill this function, of course, it must first draw attention to itself. It must be striking: that is, it must clearly foreground itself and present itself as an indicator, like a poster. But...it should not attract attention to itself in such a way that one lingers over it, for it is there only to make present something that is absent and to do so in such a way that the absent thing, and that alone, comes to mind.... There is something schematic and abstract about them, because they point not to themselves but to what is not present....⁶⁶

An architectural drawing certainly refers to something other than itself. However, it is not precisely an example of Verweisung, in that to “point away from itself” is not the sole function of an architectural drawing.

⁶⁴Justus Buchler, ed., Philosophical Writings of Peirce, p. 99.

⁶⁵Gadamer, p. 152.

⁶⁶*Ibid.*

Instead of drawing attention to itself only to let what it represents come to mind, an architectural drawing invites one to linger over it. An architectural drawing is similar to a picture described by Gadamer in the sense of giving meaning to itself. That is,

... a picture points to what it represents only through its own content. By concentrating on it, we too come into contact with what is represented. The picture points by causing us to linger over it, for as I emphasized, its ontological valence consists in not being absolutely different from what it represents but sharing in its being. ... The difference between a picture and a sign has an ontological basis. The picture does not disappear in pointing to something else but, in its own being, shares in what it represents.⁶⁷

Gadamer describes Vertreten as follows.

The representational function of a symbol is not merely to point to something that is not present. Instead, a symbol manifests the presence of something that really is present. ... It is only because what is symbolized is present itself that it can be present in the symbol.⁶⁸

A symbol not only points to something; it represents it by taking its place. But to take the place of something means to make something present that is not present. Thus in representing, the symbol takes the place of something: that is, it makes something immediately present. Only because it thus presents the presence of what it represents is the symbol itself treated with the reverence due to the symbolized. Such symbols as a crucifix, a flag, a uniform have so fully taken the place of what is revered that the latter is present in them.⁶⁹

⁶⁷Ibid., p. 153.

⁶⁸Ibid., p. 153-154..

⁶⁹Ibid., p. 154.

Obviously, an architectural drawing is taken, in the context of architectural production, to depict what is yet to come, not to manifest “the presence of something that really is present.”

Further, Vertreten has the following nature.

Through their mere existence and manifesting of themselves, symbols function as substitutes; but of themselves they say nothing about what they symbolize. One must be familiar with them in the same way as one must be familiar with a sign, if one is to understand what they refer to. Hence they do not mean an increase of being for what is represented.⁷⁰

In this way, also, an architectural drawing is not a case of Vertreten, in that the drawing, by itself, does say some things about what it represents, which is supposed, on the contrary, not to be known.

Lastly, both Verweisung and Vertreten have a trait in common, in that they do not “acquire their signifying function from their own content, but must be taken as signs or as symbols.”⁷¹ The architectural drawing, by contrast, represents what it does only from its own content.

To summarize the characteristics of architectural drawings, they are the first visual objects that physically exist during design production. They describe what they represent by letting the eyes hover over them. During design, architectural drawings make what is represented known to the beholder through certain qualities they possess, such as being a certain projection, being drawn with specific techniques, or being a particular size.

⁷⁰Ibid.

⁷¹Ibid., p. 154-155.

Drawing and Design

An architectural drawing cannot rightly be described as a mere means of communication, for it would then mean that a single meaning was intended and that the conveyance of other meanings constituted a case of miscommunication, either the sender's or the receiver's. To perceive something that was not meant would therefore be a failure of the drawing.

On the contrary, it is in the nature of architectural drawings to sustain interpretations other than what has been precisely prescribed. This happens when the eyes of the beholder meditate over the drawing, allowing it to become something independent of what it represents. This is probably caused by the particular nature of representation by architectural drawings, namely that they acquire their signifying function from their own content and not by being pure indication or pure substitution. An architectural drawing comes to represent only its own content, and in fact, in this quality lies the power of architectural drawings to generate design.

Drawing as Speculative Act

Michael Graves has described drawing as a speculative act:

In exploring a thought through drawing, the aspect which is so intriguing to our minds, I suspect, is what might be regarded as the speculative act. Because the drawing as an artifact is generally thought of as somewhat more tentative than other representational devices, it is perhaps a more fragmentary or open notation. It is this very lack of completion or finality which contributes to its speculative nature.⁷²

⁷²Graves, "Necessity."

Graves describes as a "game" the passing back and forth of drawings between himself and his colleague. The game begins when Graves' drawing is returned by a colleague with a number of marks. The two pass the drawing back and forth, being

careful to make each gesture fragmentary in order to keep the game open to further elaboration.⁷³

This game ends when another colleague kills the ambiguity of the drawing by introducing definite scale. For Graves, the drawing, even a "definitive" one, not to mention a "preparatory" one, "instructs as much by what is left out as by what is drawn."⁷⁴

I would like to address the questions of how and why the "incompleteness" of a drawing can be so instructive. One answer is that the drawing is the record of what has already been thought of, and being such a record, it indicates to the architect what remains to be determined. However, I think this view is too simple.

The objective of this work is to demonstrate that drawings can generate ideas. Not all original ideas are expressed finitely in the drawing. The ideas may be vague at the time of drawing, or the architect may hold multiple ideas about the object. On the other hand, completely new ideas may come to him after he sees and interprets the drawing. For these two reasons, the drawing is not a simple correlate of what is in the mind of the architect. Here I consciously use "interpretation" and "meaning," to designate different situations: an architect means something when he draws

⁷³Ibid.

⁷⁴Ibid.

on paper; in a later viewing of the drawing, the same architect or somebody else interprets the drawing anew.

Graves used several expressions to describe a drawing. His "lack of completion" may not perfectly describe my hypothetical understanding, for the drawing probably never becomes complete, nor is completeness the goal of the drawing. "Tentative" may be a better word, for two reasons: the drawing is always a tentative record of what is in the mind, and it is always tentative because the idea may soon be developed further. I have also considered defining the notion as "multiple interpretation," but the quality that I am looking at may be something broader than that. For one thing, "multiple interpretation" does not reflect the fact that the drawing may not be a perfect record of the original meaning.

Therefore I shall use "representation" to express the hypothetical nature of drawings as such. Here, "re-" is meant to imply that the drawing is not completely the same as the idea. How different they are is yet to be discussed.

Let me go back to the difference between the two views described above. To state them again, one view regards a drawing as nothing but a correlate of an idea. The other view considers it as a tentative representation. This difference is reminiscent of the question of where an idea originates, in the mind or in experience.⁷⁵

The difference in the two views is fundamental, and yet it does not seem to be recognized except in special situations. For instance, when

⁷⁵Władysław Tatarkiewicz, History of Aesthetics (The Hague: Mouton, 1970-74), vol. 1, pp. 141-144.

Pauline Saliga describes preliminary sketches, she does not specify which of the two views she takes:

Even though a preliminary design is, ordinarily, loosely drawn and can even resemble architectural shorthand, this stage is particularly important because the process of conceptualization begins here. Like the thought it records, it is fragmentary in nature, an artifact borrowed or invented to be elaborated later.⁷⁶

Saliga recognizes the fragmentary character of preliminary drawings, yet she considers this to be a result of the fragmentary nature of the idea. She also does not specify the way that the drawing is involved in the elaboration of the design. For her purposes, it may not be necessary to clarify these questions. Nevertheless, for the discussion of the role of drawings during a process of design, the difference between the two views becomes significant.

Interpretation as Production

Interpretation of an architectural drawing should not be considered merely as the formulation in the mind of an image of a building, but should include the production of another drawing. For, especially during the designing process, another drawing, usually more precise than the earlier one, is produced by the interpreter. The latter drawing embodies the interpretation.

In concrete terms, producing a set of working drawings after sketches, or constructing a building after making the working drawings, should be considered as kinds of interpretation, and such interpretation as part of the

⁷⁶Pauline Saliga, "The Types and Styles of Architectural Drawings," Chicago Architects Design (New York: The Art Institute of Chicago and Rizzoli International Publications, Inc., 1982), p. 20.

process of architectural design. This continuous production of artifacts, in which an artifact is interpreted and then developed into another artifact, which in turn is interpreted, and so on, may be considered one of the peculiarities of the type of interpretation that takes place during the process of architectural design.

Let us move on to a discussion of what is meant in the drawing originally, and what can be interpreted later. The multiplicity of meaning or interpretation has been discussed by many thinkers. Peirce implied it when he defined signs and categorized them. Others have come up with ways to categorize the interpretations. These categorizations are not always the same among researchers, but are all relevant in relation to their subject matters and interests.

Paul Ricoeur has defined "multiple meaning" as follows:

a certain meaning effect, according to which one expression, of variable dimensions, while signifying one thing at the same time signifies another thing without ceasing to signify the first.⁷⁷

This definition brings us to the question of simultaneous meaning versus change of meaning. According to this definition of Ricoeur's, multiple meaning is limited to the simultaneous condition in which "one expression...signifies another thing without ceasing to signify the first." A number of authors, including Ricoeur himself, have recognized that this possibility of multiple meaning sometimes serves creativity.⁷⁸

⁷⁷Paul Ricoeur, "The Problem of Double Meaning as Hermeneutic Problem and as Semantic Problem," in The Conflict of Interpretations ed. Don Ihde, (Evanston: Northwestern University Press, 1974), p. 63.

⁷⁸Ricoeur, The Rule of Metaphor: Multi-disciplinary Studies of the Creation of Meaning in Language, trans. Robert Czerny (Toronto, Buffalo, London: University of Toronto

In the field of art history, the fact that an art object carries multiple meanings has been much studied. Erwin Panofsky's study successfully categorized the multiple meaning of works of art with an objective of reconstructing what was in fact in the mind of the artist, consciously or unconsciously, at the time of production. Rudolf Wittkower's study has a different perspective. His consideration included the interpretation of works of art in later times, and the question of what such an interpretation possibly does to the art object.

Panofsky defined the "branch of the history of art which concerns itself with the subject matter or meaning of art" as "iconography."⁷⁹ He identified three categories of meaning in works of art: "primary or natural subject matter," "secondary or conventional subject matter," and "intrinsic meaning or content." The primary or natural subject matter is understood "by identifying pure forms, ... as representations of natural objects ... by identifying their mutual relations as events; and by perceiving such expressional qualities."⁸⁰ The secondary or conventional subject matter is learned by connecting "artistic motifs and combinations of artistic motifs (compositions) with themes or concepts."⁸¹ Thirdly, the intrinsic meaning or content is comprehended "by ascertaining those underlying principles

Press, 1977), originally published as La Metaphore Vive (Paris: Editions du Seuil, 1975), p. 4-6.

⁷⁹Erwin Panofsky, "Introduction," in Studies in Iconology: Humanistic Themes in the Art of the Renaissance (New York: Oxford University Press, 1939; New York and Evanston: Harper and Row, Publishers, 1962), pp. 3-17.

⁸⁰*Ibid.*, p. 5.

⁸¹*Ibid.*, p. 6.

which reveal the basic attitude of a nation, a period, a class, a religious or philosophical persuasion.”⁸² Panofsky also gave a separate name to each act of interpretation that associates a work of art to one of the three meanings: They are, successively, “pre-iconographical description,” “iconographical analysis,” and “iconographical interpretation” or “iconographical synthesis.”⁸³

In relation to the present discussion, attention needs to be directed to the following two issues that are taken up in Panofsky’s article: one is the distinction between conscious (or intentional) and unconscious meanings; the other is the notion of “correct” meanings. Both are related to the question of original meaning.

First, let us consider the distinction between the conscious and unconscious meanings of a work of art. According to Panofsky, the secondary subject matter is always what the artist consciously intends to express, but the primary subject matter “may well be unintentional,” and the intrinsic meaning is “generally unknown to the artist himself and may even emphatically differ from what he consciously intended to express.”⁸⁴ The inclusion of unintentionality into the meaning is not always commonly held. One only has to refer to Robert Klein. When Klein discussed iconography, he limited the art historian’s interpretation of a

⁸²Ibid., p. 7.

⁸³Ibid., p. 5, 7, and 8.

⁸⁴Ibid., p. 7-8.

work of art to “what is intentionally signified by the mode of representation.”⁸⁵

One needs to realize that the definition of synchronic and diachronic meanings, proposed by Ferdinand de Saussure, cannot explain the three meanings of Panofsky. The reason is that while Panofsky’s consideration of meaning is restricted to the artist at the time of production, the Saussurian definition can be used either with Panofsky’s restriction or for the interpretation of later time by people other than the artist. This multiplicity of interpreters leads to contradictions. Although the intrinsic meaning is not synchronic in that it was not conceived by the artist, it is synchronic from the point of view of the art historian who interprets the work of art. Moreover, while such an intrinsic meaning is diachronic because it is recognized by an art historian some time after the work has been produced, it is not diachronic because it is not a change of meaning.

Secondly, one should observe that, to Panofsky, there is a single correct interpretation:

How do we arrive at a correct pre-iconographical description, and at a correct iconographical analysis in the narrower sense, with the ultimate goal of penetrating into the intrinsic meaning or content?⁸⁶

To say something is correct, one needs to set a purpose according to which the judgment is made. Panofsky’s aim of interpreting a work of art is,

⁸⁵Robert Klein, “Thoughts on Iconography,” in Form and Meaning (New York: Viking Press, 1979), trans. by Madeline Jay and Leon Weiseltier, p. 144.

⁸⁶Panofsky, p. 9.

concretely, to recapture the original meaning that the artist conceived, whether consciously or unconsciously.

It is important that the "correct" interpretation is not limited to what was consciously meant. I have used "original meaning" loosely until now. I have mentioned the possibility that something is meant originally, and yet the architect somehow does not put it into the drawing. However, there is another type of what should be called "original meaning." Even if the artist did not realize their existence at the time, the work contains within its original meaning the underlying principles which come from the attitude of a nation, period, class, or religious or philosophical persuasion. This should be included as a part of the original meaning. To recapitulate, a meaning is correctly original when it is synchronic to the sign production, as discussed earlier, regardless of whether the artist is conscious of the meaning.

If the idea exists in the mind of the architect at the time the drawing is made, or if it has an influence on the architect then, then we should call it original.

I would like to extend consideration to what Panofsky might have called incorrect interpretation, for an architect working on a design may not have the same attitude as an art historian.

Rudolf Wittkower, divided interpretation into two kinds, "rational" and "emotional," and further divided "rational" interpretation into representational, thematic, multiple, and expressive meanings.⁸⁷ In any rational interpretation, the question is asked whether it corresponds to the

⁸⁷Wittkower, "Interpretation of Visual Symbols," in Studies in Communication (London: Martin Secker and Warburg, 1955).

original meaning, as is the case in Panofsky's study. However, Wittkower adds:

As we proceed from representational to thematic and on to multiple meaning and expression, it becomes more and more difficult to control the objectivity of statements.⁸⁸

This latter kind of interpretation does not necessarily correspond to the original meaning, but rather may create a change of meaning.

As Wittkower admitted, the "emotional" interpretation is not correct from the point of view of iconology:

When existing works of the near or distant past are given a new meaning we should, strictly, talk of misinterpretation.⁸⁹

By calling such a new meaning a misinterpretation in the strict sense, Wittkower recognizes the role of such a change of meaning in the making of art.

The title of his study, "Interpretation of Visual Symbols," manifests Wittkower's desire to consider change of meaning based on emotional response to a work of art. "Visual symbol" is used instead of "works of art":

In the context of this essay I want to comprehend the term 'visual symbol' in its widest sense. A representation—as primitive or as childlike as it may be—embodies a concept.⁹⁰

At the same time, he took "interpretation" in its widest sense and considered it as basically the same as sensory experience:

⁸⁸Ibid., p. 117.

⁸⁹Ibid., p. 121.

⁹⁰Ibid., p. 109.

I need hardly stress that all perception is interpretation. The primary sensory experience of the normal act of vision and of viewing a work of art is, of course, identical.⁹¹

Wittkower considered the change of meaning which is characteristic of works of art:

Whereas the meaning of such conventional signs as traffic lights has been fixed and accepted by general consent, no such agreement exists and can exist in the arts. The meaning of the work of art is open to interpretation.⁹²

Furthermore, he considered change of meaning, made possible by emotional response, as the basis of artistic creation. According to Wittkower, a work of art can continue to be meaningful in a different way, when the misinterpretation is held by the masses. Moreover, a new, different kind of work of art may also be produced based on the old symbols, but with new meanings.

Collective misinterpretation is of an importance hardly to be overrated. We owe to it not only the persistent interest in a great many images of the past, but also decisive stimuli for the creation of new symbols.⁹³

Wittkower called the incessant process of interpretation the "life-story" of symbols, and the arts that allow this special condition a "living heritage."⁹⁴

⁹¹Ibid., p. 110.

⁹²Ibid., p. 109.

⁹³Ibid., p. 121.

⁹⁴Ibid., p. 110.

The interpretation during an architectural design process takes place in a shorter span of time and among a smaller number of people than the "life-story" of a work of art. However, the creative process of architectural design is, it is speculated, based on this function of visual interpretation.

To sum up, the act of interpretation takes place not only at the time of the original production of the work of art, but also at the other times when anyone, including the original artist, encounters the same object and finds it meaningful.

Three concepts derive from the above considerations: intentional meaning, which the artist gave to the work of art; unconscious meaning, which the artist did not recognize but which was present at the original production; and other meanings, not original, which are associated with the object in the course of time either by the emotional response of an interpreter or by the failure of objective interpretation.

Conflicting Interpretation

I should make it clear that I do not expect all interpretations to generate new ideas and further develop the design. Wittkower distinguished between "vitalization" and "devitalization."⁹⁵ In the former a change in meaning works toward the creation of a "new" work of art. Devitalization reduces it to mere decoration. In other words, only some interpretations are vitalizing.

It is not clear whether one can apply a discussion that Graves has developed on the virtue of tentativeness of drawing to these conflicting

⁹⁵Ibid., p. 121.

interpretations. One might say, on the one hand, that the relationship between the original and the new interpretations which appears in Graves' article is not precisely a conflict, but rather, the new interpretation reduces the possibilities that the original drawing actually possessed because of its incompleteness. On the other hand, one should admit that at least some of the interpretations that are offered between Graves and his colleague conflict with what was originally meant.

Architects seem to dislike it when their designs are interpreted differently from their original intentions. This sometimes becomes apparent when the jurors of a competition are said to choose the winning design based on an interpretation different from what the architect intended. In fact, the guidelines for competitions that are published by architectural professional organizations, such as the Royal Institute of British Architects or Scandinavian organizations, recognize the importance of multiple interpretations from "abstract to concrete," although they try to avoid conflicting interpretations. In order to do so, they recommend two-stage competitions. In the first stage, they can encourage the submission of rather abstract drawings that promote useful multiple interpretations that advance the design from abstract. In the second stage, they can request more concrete drawings to bring interpretation as close as possible to what is intended by the entering architect.

However, it is not only during competitions that this type of multiple interpretation takes place. It occurs also on other occasions, and most architects feel troubled when their clients or fellow architects interpret their scheme in a different way. Therefore, conflicting interpretation is not an

issue limited to competitions; it is also applicable to the much wider field of the architectural design process.

In order for conflicting interpretation to be useful, the alternate interpretation has to be the kind that convinces the architect himself by its own merits. By "convincing," it is meant here that the architect welcomes the conflicting interpretation and he works to advance his design according to it. Since the new interpretation is conflicting, he has to, precisely speaking, regress—to disown some of the characteristics of his design that had to him been concrete, replace them with the newly offered interpretation, and advance the design toward a new concreteness.

Any drawing representing what does not yet exist physically necessarily leaves that drawing open to interpretation, interpretation toward design.

How Drawing Generates Design

Through a review of previous scholarship, the following five ways in which drawing generates design have been identified. They are meant to be distinguishable from each other, and yet not meant to be absolute as a classification. These five are not exclusive of each other, nor are they conclusive: A drawing may generate a design in a way that is a combination of a number of the following five; there may be other ways as well.

Particular Reading from the Ambiguous

In the progress of a design, a drawing sometimes remains ambiguous. This is often precisely because of the ambiguous state of the design in the

mind of the architect. However, as a record of an ambiguous design, the drawing is a physical object independent of the ambiguous design. The drawing thus often allows a viewer to associate a particular reading. Examples of such drawings are seen in the study of Grand Prix designs in the Ecole des Beaux-Arts by Neil Levine, referred to earlier (fig. 10).

Particular Reading Different from That Originally Intended

In a case where the architect has defined his design and has produced a drawing that precisely represents the design as defined by him, there still is room in the drawing for multiple interpretations.

Suggesting Other Alternatives

By being a precise representation of what the architect has defined as the design, the drawing also possesses the ability to suggest other alternatives to the scheme. In this case, the drawing is to be read as one of many alternatives.

According to Levine, in the Ecole des Beaux-Arts there were usually a few possible partis for any given program. Students produced drawings such as those in fig. 21 in order to generate all possible partis.⁹⁶ While drawing one parti after another, it is naturally assumed that the one already drawn initiated the others, by being concretized as one of the alternatives on a sheet.

⁹⁶Levine, p. 95.

According to Howard Burns, Palladio quickly drew alternatives for a design on a sheet of paper at a small scale (fig. 22).

Palladio was able in ten or fifteen minutes to generate most of the solutions which were compatible with the site and with his architectural system.⁹⁷

The reason he could do this was established in his method of design.

... his first ideas emerged rapidly and lucidly on paper because he was not evolving entirely new solutions, but applying to particular sites and circumstances the solutions and motifs which he had isolated in the antique (or projected on to it) and had experimented with in earlier projects. In designing he was in effect shuffling through his repertory for appropriate solutions.⁹⁸

In this method of design, the "the real moment of 'invention' is well upstream from the apparent moment of composition"⁹⁹ and Palladio relied heavily on memory. Even if the moment passed as quickly as Burns estimates, Palladio was looking at whatever had already been drawn on the sheet while drawing another alternative. In this, Burns seems to agree that it was necessary for Palladio to consult his collection of drawings in order to come up with further alternatives.

Palladio as a working architect (and as the author of architectural books) needed to preserve his drawings from the antique and his finished project drawings carefully: these contained his repertory of motifs and the suggestions for new designs.¹⁰⁰

⁹⁷Howard Burns, "The Lion's Claw: Palladio's Initial Project Sketches," *Daidalos*, no. 5 (1982), p. 77.

⁹⁸*Ibid.*, p. 78.

⁹⁹*Ibid.*, p. 77.

¹⁰⁰*Ibid.*, p. 73.

This visualization in drawing must help the architect see the alternatives that have not yet been drawn, even if one admits that Palladio had already conceived all the alternatives in his mind before he began the act of drawing.

Forcing the Architect to Look at a New Set of Issues

As discussed in a former section, an architectural drawing, by its particular projection, drawing technique, or medium, depicts a specific aspect of the building. Because of this, the architect is sometimes forced during the act of drawing to look at particular features of the design. For example, if he has been drawing the design in the form of a plan, and he then decides to draw a perspective, he is suddenly forced to consider the issues which are necessary to the perspective, but which he may have overlooked in drawing the plan. In a case like this, the drawing works to force the architect to consider new issues during the course of drawing.

Concrete Existence of an Accidental Movement of the Hand

As Burns suggested in his discussion of Palladio's initial sketches, Michelangelo had a different method of design, and therefore a different use of architectural drawing. For Michelangelo, the drawing served sometimes to give concrete existence to an accidental movement of his hand.

The 'invention', through it often has its starting point in a previous work of the artist, grows as a result of a dialogue between the artist's mind, well furnished, like Palladio's, with preconceived compositions, and the forms

developing on paper as the hand draws. Accidents, superimposed alternatives, changes of drawing medium all contribute to the final result, so that the design is not *preordained* (one can recall Alberti's definition and his term *prescription*) as it seems so often to be with Palladio, but really is created by hand and mind in the course of drawing.¹⁰¹

Another case is the sketches by Constant Désiré Despradelles studied by Werner Oechslin (fig. 23).¹⁰²

With these rough sketches—characterized by the use of the most 'unsharp' and crudest of all graphics tools, the charcoal—he seems to have subjected himself directly to spontaneous invention. ...This sketch outlines the main features of the architectural composition, no more and no less. In this way, the composition of a highly complicated complex, such as that of a university, is transformed into a problem of spontaneous expression of the invention which takes only a few seconds—just as demanded in the definition of the first sketch.¹⁰³

I have identified above five ways in which a drawing generates a design. In all these five, the importance lies in the fact that the drawing is a physical object. By thus being, the drawing can become independent from the original state of mind of the architect, yet retain the way it was produced as the product.

These five have been adopted from scholarship, but those studies do not specifically state that the drawings in fact generated the designs. It is therefore my task to demonstrate that there are in fact these five ways for an

¹⁰¹*Ibid.*, p. 77.

¹⁰²Werner Oechslin, "The Well-Tempered Sketch," in *Daidalos*, no. 5 (1982), pp. 99-112.

¹⁰³*Ibid.*, p. 111.

architectural drawing to generate a design. I shall do this by studying an actual, concrete example.

CHAPTER II

METHOD AND SELECTION OF CASE

In the first chapter, architectural drawings were defined as those which are created to take an active role in the production of architecture.

It was proposed that an architectural drawing is not only a depiction of a design that already exists in the architect's mind, but also something that can generate design. This doubled-faceted proposition entails some methodological problems, chiefly growing out of questions of objectivity in interpreting the human mind and of the applicability of single-cased research.

In the first part of this chapter, the methodology of demonstrating what is predicted by theory will be discussed.

The method is as follows: Taking an exemplary case, I analyze in chronological sequence each of the architectural drawings produced during the design up through the final stage of the competition. In addition, I analyze the relevant contemporaneous documentation, including correspondence among those involved. Every drawing presently available is examined. Through a comparison of the drawings in sequence, developmental changes in the design are detected. Then, through interpretation of the drawings, as well as reference to other sources of information, I attempt to cast light on what caused the changes, paying

particular attention to how prior drawings in the sequence could have influenced the development.

The case selected is Eero Saarinen's entry in the Jefferson National Expansion Memorial Competition in 1947-48. The reasons for this selection will be discussed in the latter portion of this chapter.

Architectural drawings have two roles in this research. On one hand, they are the materials of this research, the artifacts that provide access to the architect's concept of the design at each stage. On the other hand, they are the objects of research, to be examined for evidence that they functioned as generators of change in the design.

This is, perhaps, an unconventional way to deal with a thesis. However, the methodology must suit the purpose of the research. Given the objective of this research—to confirm the existence of an intuitively known phenomenon—and the unavailability of direct access to the mind of the architect, it will be argued that the method chosen is the best available.

To this end, I must raise the issue of what is the purpose of theory in architecture. The first question I would like to address in this connection is whether theory is the pursuit of knowledge.

In short, knowledge does not seem to be the goal of theory. For to know presupposes something "unknown." The world, at least in this context, is already "known" by architects through their experience. Any architect might well agree with the proposition that architectural drawings generate design. As with Graves, he would do so intuitively, referring to his recollections of daily practice.¹ He might say that some drawings offered

¹Graves, "Necessity."

interpretations different from his original intention, either to him or to other observers, which influenced his subsequent design. He might also say that sometimes the process of drawing itself actually generated new ideas for developing the design. In this way, a practicing architect “knows” the world he inhabits. If theory were knowledge, then theory would be there. However, I will argue that theory is more than intuitive knowledge.

Admitting that the topic of this research does not share common ground with scientific studies, I was led to examine the body of work that has been produced by phenomenologists since Edmund Husserl.

Philosophy, as Maurice Merleau-Ponty used the term, may be the proper word to define the purpose of architectural theory. His assertion that the role of philosophy lies in “bringing truth into being” is particularly useful in this context.

Philosophy is not the reflection of a pre-existing truth, but, like art, the act of bringing truth into being. One may well ask how this creation is possible, and if it does not recapture in things a pre-existing Reason. The answer is that the only pre-existent Logos is the world itself, and that the philosophy which brings it into visible existence does not begin by being possible; it is actual or real like the world of which it is a part, and no explanatory hypothesis is clearer than the act whereby we take up this unfinished world in an effort to complete and conceive it. Rationality is not a problem. There is behind it no unknown quantity which has to be determined by deduction, or, beginning with it, demonstrated inductively.²

Architectural theory works to formulate out of the architects’ world, which may already have been known to architects, a concrete existence based on a

²Maurice Merleau-Ponty, Phenomenology of Perception, translated from the French by Colin Smith (New York: Humanities Press, 1962), p. xx.

solid foundation, which a practitioner's impression of his own experience, however insightful, lacks. I shall try in this research to "bring the truth into being" about architectural drawings.

The Objectivity of the Human Mind

Objectivity would seem to be a prerequisite for any research, and yet it is possible that by some standard views of objectivity, this research would be perceived as unsound.

The central question in this research--whether a drawing can cause the architect to conceive something new--involves an examination of the state of the architect's mind. The crucial issue is whether this state of mind can be an "object" of research. A derivative, but highly important question is whether the researcher's interpretation of drawings can be an appropriate method for objective research--and for accessing the mind of the architect.

Webster's Dictionary includes in the definition of "object" "anything visible or tangible; a material product or substance."³ "Objective" is consequently "of or having to do with a known or perceived object as distinguished from something existing only in the mind of the subject, or person thinking," and therefore "without bias or prejudice; detached; impersonal." Concisely put, this definition views an object to be a physical entity, and its physical substance is the prerequisite for anything to be objectively known. This brings into question how the mind of the architect,

³Webster's New Twentieth Century Dictionary. Second edition, William Collins and World Publishing Co. Inc., 1975.

with no physical substance, can be discussed and how such a discussion can avoid prejudice or subjectivity.

The line between objective and subjective may not be as clean as is ordinarily believed. It has to be remembered that everything, even scientific knowledge, is based on a personal experience of the world.

All my knowledge of the world, even my scientific knowledge, is gained from my own particular point of view, or from some experience of the world without which the symbols of science would be meaningless.⁴

This passage from Merleau-Ponty's writings do not signify a sudden attempt to redefine basic concepts of science. Early in this century, Husserl took up the question of subjectivity that exists in so-called scientific research.

In the essay *Philosophy as Rigorous Science* (1911), Husserl said of traditional academic philosophy that as science it had not yet begun; indeed, the reason for its inability to do so was basically that it had not become aware of the totally subjective beginning of all philosophical scientific positions.⁵

Recent formulations of this line of thought carry it further into the realm in which this research takes place.

... what we have is "knowledge of something subjectively considered true." Knowledge of the subjective, knowledge also of the subjectively grounded, does not in the least subjectivize this knowledge, which is and remains a knowledge of a second kind: namely, ascertainment of what can be known in respect to the subject and the subjective grasping of the phenomenon.

⁴Merleau-Ponty, *Phenomenology of Perception*, p. viii.

⁵Maurice Natanson, *Edmund Husserl: Philosopher of Infinite Tasks* (Evanston: Northwestern University Press, 1973).

This is the "object," and the knowledge that refers to it remains "objective".⁶

I am not attempting to abolish the line between objectivity and subjectivity in my research; rather I am arguing that a legitimate, and indeed complementary role exists for both. What I try to do in this study is, by examining physical objects, access the subjective or "non-objective" mind of an architect. It is, therefore, important to this research that the materials that I refer to are accessible to others; for it is only when they have been considered by others, and when my interpretations have found a meeting point with the interpretations of others, that the rationality of my research can be ascertained.

Again, Merleau-Ponty:

To say that there exists rationality is to say that perspectives blend, perceptions confirm each other, a meaning emerges. ... The phenomenological world is not pure being, but the sense which is revealed where the paths of my various experiences intersect, and also where my own and other people's intersect and engage each other like gears...⁷

The Human Mind as the Object of Research

The first problem is the question of whether the state of mind of the architect is at all accessible as an object to the researcher.

The architect's mind, which I am to examine, is not an object in a sense that Cartesian science, or Webster's Dictionary, would consider. My

⁶Gerhard Funke, Phenomenology—Metaphysics or Method? with a foreword by Thomas M. Seeborn, translated by David J. Parent. (Athens: Ohio University Press, 1987),

⁷Merleau-Ponty, Phenomenology of Perception.

research is not objective in such a sense. The mind of the architect is known only through the researcher's interpretation of the architect's expressions—in drawings or words.

The natural-scientific approach generally deals with objects that are quantifiable, and therefore considers itself as objective and universal. However, it must be noted that such a method puts significant "non-objective" phenomena—such as the subject of this research—out of bounds.

The "scienticized world view," which, according to Husserl, stands completely under the sign of Galileo relates only to the general aspect of an object graspable in size and number, which object then in turn, as a concrete object, simply represents a particular case of the appertinent law.⁸

In architectural theory, which has to deal with the creativity of the human mind, there is a need to go beyond size and number, and yet avoid prejudice and bias.

Knowledge does not become non-objective because it does not refer to the object in the natural-scientific sense.⁹

The mental concept, though not concrete, can be an "object" in the sense that it actually exists and is accessible to the researcher through its manifestations.

⁸Funke, Phenomenology—Metaphysics or Method?.

⁹*Ibid.*

Interpretation of Drawings as Primary Method

The design in the mind of the architect is accessed in this research primarily by the researcher's interpretation of architectural drawings and of the contemporaneous writings, if any, which accompanied them. There is a question whether such an interpretation can produce valid research. There may even be a suspicion that this method necessarily involves the researcher's prejudices and is therefore flawed.

Architectural drawings do exist as physical objects and, therefore, can be accessed by others. I will argue that the interpretation of drawings in a series can yield verifiable results, and that other methods are insufficient to establish the thesis. That is to say, my interpretations of changes in the design process can be evaluated by others on physical-objective grounds.

Inadequacy of Alternative Methods: Interviews and Writings

A few interviews have been conducted in the course of this research; however, they are treated only as supporting materials for the interpretation of drawings and contemporaneous writings. Interviews by this researcher cannot be considered primary materials for this research. The reason is that they do not provide the material in its raw state. In other words, they require the intervention of the researcher. Furthermore, over-reliance on interviews or writings runs the risk of closing off certain areas to debate.

One danger of interviewing architects is that the results can be influenced by the interviewer's biases. Even without prompting from the

interviewer, an architect may distort his views out of a desire to improve on history, make a good story, or simply because of faulty memory. Moreover, the general danger of the interview as a method is that the interview is likely to be treated as factual data. If the interview receives treatment as definitive data, it does not allow the possibility of counter-argument. As such, it is not equally accessible to other researchers, with whom I expect to be able to share the evaluation in common, in order to form, according to Merleau-Ponty, a basis for rationality.

The interpretation of contemporaneous drawings and writings in this research is intended to be open to discourse. These are to be distinguished from retrospective writings, which must be regarded more skeptically. When an architect sits down to write, he does not sit down without purpose, which may distort the record of his experience. In addition, later experiences may color earlier ones.

When this occurs, the world does not remain a “pregiven,” as the phenomenologists call it. Rather, the researcher starts to control, or at least shape, the world.

[Phenomenology] is also a philosophy for which the world is always ‘already there’ before reflection begins—as an inalienable presence.¹⁰

To reiterate, in order for this research to be sound, the evidence has to be pre-existing, without the researcher’s personal influences.

¹⁰Merleau-Ponty, Phenomenology of Perception, p. vii.

Problems of Observing On-Going Design

I have chosen to focus on a historical case rather than a contemporary one for the same reason that the interview was not treated as the primary method of research. That is, to secure the object of examination as the world pre-given is not possible in a self-conscious research project that happens to be an on-going design. This is in contrast to the world of scientific research, where a controlled studies are routine.

The study of an on-going design for my purposes would present the general danger that the presence of the researcher with a specific point of view would influence the course of the design outcome. In any event, the researcher would be unable to provide any evidence to the contrary.

Accessing the Mind through Drawings

It is, of course, commonplace in architectural criticism to presume a degree of access to the architect's mind through his drawings. It should be noted that, although the intention of this research is to emphasize the representational and creative functions of drawing, it is necessary for this research to be able to take into account the other side of the nature of the drawing, that is, to depict ideas pre-existing in the mind. Undeniably, the architectural drawing is, to a large degree, a presentation of ideas that already exist in the mind of the architect. In that sense, it certainly provides access to the architect's mind.

This research examines chronologically all available drawings produced during the designing process. Particularly, the changes of design between a given drawing and the one following chronologically are to be

considered. In some cases, missing drawings are accounted for by descriptive contemporaneous comments from the designers. As such, this method has less chance of being influenced by the researcher's prejudice or pre-determined purpose. The reason is that the changes in drawing are detected as concrete, physical matters, and, therefore, have less danger of being only in the eye of the researcher and no one else. Once detected, such changes in drawing identify the changes in design concept.

It is also important that the context of the drawing is revealed. This includes information about the architect, how he worked on other designs, what historical background may have influenced him, details about the project, how the client was involved in the design, the nature of the project, and so on. The interpretation of the drawing should always be examined against such context.

It is not the intention of this dissertation to claim that all design developments are generated by drawings. Some examples of other major causes that can change design are: the demands of the client, the changing conditions of the site, and restrictions on construction. In order to argue the influence of drawings on design development, one has to distinguish other such factors. It is possible to say that a drawing is the cause of a certain design change only if it is established that it is not caused by other factors. Consequently, I will spend considerable effort to identify the external influences on the design and determine the limitations of those factors.

Universality of Single-Cased Research

A single case has been selected for examination in this research. There are possible problems with this, namely establishing the potential applicability of the conclusions to other cases. The more universal the thesis is, the more valid the research would seem to be. Conducting research on only one instance might restrict the validity of the thesis to that case.

The question is similar to the one raised in the previous section about the objectivity of research. Here, instead of the danger of the researcher forming an interpretation based on her own particular viewpoint and therefore not applicable to the other viewers, the problem lies in the possibility that what is verified in one particular instance may not be the case in others.

It must be understood, however, that I am not attempting to prove that drawing generates design in all instances of architectural production. Rather I am attempting to confirm and analyze a phenomenon that has been intuitively recognized by many in the profession. To succeed in this it is necessary only that the case be exemplary and well documented and the analysis sound. The potential applicability to other cases may be inferred.

Neil Levine, in studying the teaching of architecture at the Ecole des Beaux-Arts in Paris, took the Prix de Rome competition in 1824 as the subject of his research. The Ecole endured from 1819 to 1968, or even from 1671, if one includes the period in which it was operated as the school of the

Académie Royale d'Architecture.¹¹ However, Levine chose to single out one year:

One would like to know, for instance, what the average age of the winner was and if he should be thought of as a student or a young professional; whether the judges were the old fogies they are usually depicted as being; whether the competition was really anonymous; whether the programmes were as unrealistic as they are assumed to have been; what the relationship was between the Académie des Beaux-Arts and the Ecole in this one instance where their paths formally crossed. It is hoped that, by investigating one year in particular, answers to these as well as to the more fundamental questions of criteria of judgment may be suggested.¹²

He chose that particular year because he was "able to locate [all] eight designs" of the finalists, both for the first and the second stages in that year, while for most years the available drawings were limited to the renderings and esquisses of the winning design, which the Ecole kept. "It was, luckily, a particularly noteworthy year since the winner, Henri Labrouste, was to become one of the leading figures in the development of modern architecture."¹³ Levine chose one case by the availability of the drawings. Thus the value of his research was increased by a coincidental fact that the winner himself was to become an important architect to learn about.

The method of research in this dissertation is the same, in that one case is studied in the hope that the results will throw light on more general questions. Knowledge of the world, even that based on the natural-scientific

¹¹Richard Chafee. "The Teaching of Architecture at the Ecole des Beaux-Arts," in The Architecture of the Ecole des Beaux-Arts, ed. by Arthur Drexler, p. 61.

¹²Levine, p. 67.

¹³Ibid., p. 68.

method, is limited to the objects that are studied. In order to secure a foundation upon which the inductive method may arrive at a law, natural science takes great pain to select the right cases.

If this research were intended to discover a law governing all architectural designs, then the examination of cases would be based on the logic of induction. For such a purpose, the selection of a representative sample of cases, as in the study of natural sciences, would be crucial to the validity of the induction. Therefore, the number of cases would have to be quite large to provide a statistical foundation; alternatively, one might intentionally select the case that seems most likely to refute the thesis and prove the antithesis with it.

Although it is usually taken for granted that induction produces valid results, there is of course no guarantee that induction will always prove right. As to my method, it is consciously recognized from the beginning that it can only guarantee the result in the very case examined in the research. It therefore becomes more important to know about one phenomenon deeply, rather than to pretend that the thesis works as an absolute law.

However, this research has not abandoned the objective of achieving universality. Just as personal interpretation of drawings can be undertaken with the intent of achieving objectivity, the study of a single subject can be undertaken with the intent of achieving universal potentiality. By selecting an exemplary case of architectural design, I hope to prove not only that the thesis is possible in this case but probable in others.

It should be emphasized that my thesis is written with the expectation that there are some cases of design in which drawing does not perform a generative role, and that even when it does, the way in which it generates design may not include all of the five that have been specified or may differ from the five.

As stated before, there are other factors in the process of design that generate the design. It would not be at all reasonable to expect that a design to be entirely generated by drawing. Some aspects of the design may be generated, for example, by the nature of the site which the architect observed or by the kinds of building materials to be used. Furthermore, the research is not expected to show that every drawing in the sequence under study generates design.

Characteristics of Competitions as Process of Design

The materials selected for this research are from the two-stage competition for the Jefferson National Expansion Memorial, held in 1947-48. Eero Saarinen and his team, consisting of himself, architect; J. Henderson Barr, assistant architect; Dan Kiley, landscape architect; Alexander Hayden Girard, painter; and Lily Swann Saarinen, sculptor, won first prize.

I will go into the reasons for selecting this competition and this architect later, but the characteristics of competitions themselves bear some attention. It is necessary to point out that a competition's peculiarity does not invalidate the applicability of this research to architectural design in

general. Rather, it provides a somewhat more pristine record of that relationship than is generally available. Indeed, as will be seen, non-competitions, that is, designs through direct commission, have disadvantages for the conduct of research.

Although the usefulness of the competition as a design system has been widely championed, it must be said that it has been criticized with equal energy. The shortcomings that haunt competitions seem to fall into two categories: the economy of competition and the fairness of judgment.¹⁴ As will be seen, however, the criticisms do not categorically differentiate the design process in competitions from that in other architectural processes.

In the discussion of economy, the time, cost, and effort that are involved in competitions are brought up; because of the number of architects involved who prepare designs without compensation, these outlays are enormous.

Another problem with competitions centers on the judgment. Peter Collins voiced an opinion concerning the judgment in competitions, with which most people familiar with competitions would probably agree. According to him, there are three occasions in which a fair judgment involving as many issues as possible is expected, and a competition is one of them; the other two being teaching and publication. But in many cases the requirements of the competition program, not to mention other criteria, are ignored in the judgment.

¹⁴Strong, Judith. Participating in Architectural Competitions (London: The Architectural Press Ltd., 1976).

The entrants often try to follow precisely the requirements in the program, with the conviction that the jury will observe the program and render a fair decision. Arthur Erickson is of the opinion that one can "expect a fair decision only if the jurors are judging with the same information as that which the competitors have." The organizer of the competition considers it important to provide the requirement explicitly, for they think that it makes "explicit the basis for the evaluation of entries." As Steven Izenour complained, "competition after competition--Sydney Opera House was a classic example--where the jurors don't pay attention to the hard-nosed stuff, hardly read the program, with the result that things don't work in the end." Instead of being "naive" and believing in the program, the architect chooses rather to see "who or what kind of thing is going to win"¹⁵ by looking at the jury members.

Collins drew a distinction between competition and design through direct commission based on the type of judgment involved in each.¹⁶ According to him, the usual design process only involves a limited kind of judgment, which should rather be called design decisions.¹⁷ During the usual design process, the architect "visualizes some relationship of forms intuitively, and then tries to justify it in relationships to the programme."¹⁸ This kind of judgment is limited, because, first, the architect examines a few

¹⁵Andrea O. Dean, "How Competitors View Competitions," in *AIA Journal* (August 1980), pp. 56-60.

¹⁶Peter Collins, *Architectural Judgement* (Montreal: McGill-Queen's University Press, 1971), p. 146.

¹⁷*Ibid.*, p. 109.

¹⁸*Ibid.*, p. 41.

schemes that he has come up with, omitting other possibilities that may be better, and, second, he tests the schemes under a few conditions as stated in the given program, neglecting other criteria that might be worthwhile.¹⁹ In contrast, the competition jury's judgment, in order to have any validity, has to be concerned with many other criteria.²⁰

But neither problems of economy nor of judgment set competitions apart in terms of how architects generate and develop their designs.

There are some who have completely disapproved of competitions. Frank Lloyd Wright believed that competition judgments were never satisfactory. Louis I. Kahn never won any. He expressed his uneasiness toward competitions on a number of occasions.

Despite such opposition, it cannot be denied that competitions have been and remain a major part in architectural design. More importantly, the opposition does not make a design for competition so peculiar as to invalidate the applicability of this research.

Having established that competitions are a valid context for this study, I will elaborate on the advantages they offer.

Communication between Architect and Client

In the case of a direct commission, communication between the client and the architect is so continuous that it is usually difficult to find a comprehensive record of it, and nearly impossible to isolate its influence from other factors in the design process. But in a competition, the

¹⁹Ibid., p. 40.

²⁰Ibid., p. 109.

requirements are expressed by the client solely in the form of the program and any subsequent addenda, while the architect's presentation to the client rests solely in the submission drawings. Thus, for a study of the relationship between design and drawing, a competition is as close to a laboratory case as is possible. I might add that it is not my intent to disparage the significance of client-architect communication, but only to isolate it for purposes of this study.

The criticism of competitions made by Eugène Emmanuel Viollet-le-Duc presents the advantages of choosing a competition as a case study. In the case of direct commission architects communicate their designs with the clients often. In a competition, the architect has to communicate their designs using restricted means and are not present before the jury to discuss the designs during the judging process. Viollet-le-Duc criticized this competition practice, and proposed an "improvement."²¹ He suggested that the architects of the better entries, about one third of all contestants, having been chosen by the jury, gather in front of a board of examiners and explain their schemes and discuss them with the members of the jury.

Such a system of having the entrants and jurors discuss the designs had not been uncommon in earlier competitions. Giorgio Vasari described the discussion held between Brunelleschi and his audience in the competition for the dome of Sta. Maria del Fiore.²² Two centuries later in

²¹Viollet-le-Duc, Lectures on Architecture, trans. by Benjamin Bucknall (Dover Publications, Inc., 1987), unabridged republication of the English translation (London: Sampson Low, Marston, Searle and Rivington, 1877 and 1881), vol. II, Lecture XX.

²²Giorgio Vasari, The Lives of the Artists, A selection translated by George Bull (Harmondsworth, Middlesex: Penguin Books Ltd., 1965), p. 145.

Paris, during the competition for the East facade of the Louvre, Gian Lorenzo Bernini explained his scheme in front of the king.²³

However, in modern competitions a large number of competitors submit their schemes from distant places. This seems to have made it extremely difficult to realize the suggestion of Viollet-le-Duc. This condition of modern competitions is an advantage to this research, for the client's requests are generally well defined in the program, and the influence of the client through other means is virtually nil.

Architectural drawing in competitions

The difference between a competition and a direct commission in terms of the drawing is that the architects' means to present their designs to the client is limited to submission drawings. The architect knows he must convey his design entirely through drawing. Even reputation cannot come into play when the competition entries are anonymous. Neither the architect's previous works nor his physical appearance or tone of voice can influence the jurors. Anonymity of submission drawings is considered necessary in competitions "to obviate the justice of such criticism [concerning the fairness or rightness of judgments of competitions.]"²⁴ The anonymity of the author of a design is not common in any other form of design. Indeed, it is common practice for clients to rely on past work of the architects when selecting an architect for commission .

²³Franco Borsi, Bernini (New York: Rizzoli, 1980), pp. 339-40.

²⁴"Architectural Competitions for Public Building," in The Octagon (April 1936).

It sounds odd, but it also happens that the architect uses his physical appearance or the tone of his voice to convince the client of his design and his ability to execute it. One finds examples in which an architect used such means to win the approval of the client.

In Book II of the Ten Books on Architecture of Vitruvius, an extraordinary instance of such a presentation is found.²⁵ The architect Dinocrates used his gifted nature "of ample stature, pleasing countenance, and the highest grace and dignity." Dinocrates "left his clothes in the inn, and anointed himself with oil; he wreathed his head with poplar leaves, covered his left shoulder with a lion's skin." He succeeded in attracting the attention of Alexander the Great and impressing him with his ideas and plans. Dinocrates followed him into Egypt and laid out the city of Alexandria.

If one looks at historical competitions, one even finds examples in which architects' names were known to the jurors and the architects presented their designs in person. One example was the competition for the dome of Sta. Maria del Fiore, which is described by Vasari, for which Brunelleschi presented his idea before the jurors and the public for constructing a dome.²⁶ Another example is the participation of Bernini in the competition for the design of the Louvre. He is reported to have drawn on the floor to show his design to the king.²⁷

²⁵Vitruvius, pp. 73-77.

²⁶ Vasari, p. 145.

²⁷Borsi, pp. 339-40.

In the competitions held inside the Ecole des Beaux-Arts from the seventeenth to the nineteenth century, it was impossible to keep the names of the students secret. First, their names became known because the students had to obtain permission to compete in the Grand Prix de Rome. They worked on their designs in the studio of the school, where anyone was able to observe the scheme of each entrant. Therefore, when the students submitted the designs, the jurors often knew the author of each.

The modern competition's strictly limited means of presentation from the architect to the client makes the submission drawing, at least ideally, an extreme case of presentation drawings—extreme in that the architect is supposed to know precisely what he intends in his design and precisely how he can depict the design in drawing.

Another condition of competitions which makes submission drawings special is that they mark the end, or at least an end, of the designing process. As Michael Graves described it, toward the end of the designing process, the architect has asked and answered questions of his design ideas.

The finality of the drawing means that the architect must decide just what he wants to present in the drawing and how to do it. By comparison, in sketches, the ideas are still tentative and abstract, so that when the architect moves his hand, he little knows what will result. For a competition entry, the architect must know a great deal about his design and what he wants his submission drawing to say to the jury. He must have already examined a number of ways to represent his design and have come up with the best way of drawing it.

This peculiarity of competition submission drawings works to make competitions exemplary subjects for my research. For if these extraordinarily finished presentation drawings still generate new design ideas, it is probable that other kinds of drawings, less precise and more ambiguous as to design that they present, can generate new ideas.

This research is not limited to the submission drawings of a competition. There are other kinds of drawings that precede the submission drawing, i.e., initial sketches and study drawings, even in a design for a competition. By examining these drawings, I will be able to expand the area of research to the drawing in general.

The Case Study: Significance and Availability of the Drawings

Eero Saarinen's entry in the Jefferson National Expansion Memorial Competition is the best of all the competitions one might examine, because of the availability of the drawings and supporting materials, and the historical significance of the design. It represents a time in which American architecture was seeking to add monumental possibilities to the vocabulary of modern design. It played a significant role in redevelopment of St. Louis and it continues to be a symbol of the city.

St. Louis itself was of historic significance: the base for fur trade since the middle of the eighteenth century; the location of the old French Cathedral of St. Louis; the place where Lewis and Clark set forth on their expedition; the site of the territorial handover at the time of Louisiana Purchase of 1804; and, more notoriously, the location of the Old Courthouse in which the Dred Scott case was first tried in 1847. Before the competition,

the reconstruction of the St. Louis river front had been proposed on several occasions.²⁸

With his win in the competition, Eero Saarinen rose from being the junior partner of his better-known father, Eliel Saarinen, to national and international renown.

Over and above the historical significance, which will be further described later, this design has characteristics that make it an exemplary case for this research. The major element of Saarinen's solution, a stainless-steel arch rising about six hundred feet above the ground, was acknowledged as a simple and compelling architectural idea. As such it presents an advantage for this research: changes during the evolution of the design can be clearly observed, whereas a complex design would create a more difficult task in detecting and analyzing changes. Furthermore, if changes in such a simple design are found to have been generated by drawing, then one can safely assume that more complicated designs would need even more contribution from drawing, since it would take the aid of drawing even to visualize the complex form.

The Competition

The competition was organized by the Jefferson National Expansion Memorial Association, a non-profit organization.²⁹ Luther Ely Smith was

²⁸"Some Aspects of the Planning of the Jefferson National Expansion Memorial," prepared by Daniel Cox Fahey, Jr., February, 1937, Revised July 1937 and October 1937, Jefferson National Expansion Memorial Archives, National Park Service, St. Louis, MO. (JNEM hereafter).

²⁹The association published a booklet describing the history of the memorial from the conception of the idea by Smith to the completion of the construction of the Arch. Paul Simpson McElroy, The Story of the Gateway Arch, in cooperation with the Jefferson National

the chairman of the association. The memorial was conceived in 1933 by Smith, a St. Louis resident who had worked as a member of the Federal Commission for the George Rogers Clark Memorial on the Wabash river front at Vincennes, Indiana. Smith's purpose was to commemorate the historical importance of the west bank of the Mississippi. The association was formed in 1933 and Smith was made its chairman.³⁰ On December 21, 1935, President Franklin Delano Roosevelt signed an executive order for the project to allocate governmental funds, which were to be matched by a contribution from the city of St. Louis. He also directed the National Park Service to acquire and develop the site. On January 27, 1938, the United States Court of Appeals upheld the rulings of the lower courts and made it legal to clear the land. The demolition of existing buildings on the site was completed in 1941. The financing had also to be worked out. Activities were suspended between 1941 and 1947 because of World War II.

George Howe (1886-1955) was appointed as the professional adviser by the association and worked on the selection of the members of the jury. They were: Sidney Herbert Hare (1888-1960) of Kansas City, Missouri, fellow of the American Society of Landscape Architects, and member of the American Institute of Planners; Fiske Kimball (1888-1953) of Philadelphia, Pennsylvania, fellow of the American Institute of Architects, and director of the Philadelphia Museum of Art; Louis LaBeaume (1873-1961) of St. Louis, Missouri, fellow of the American Institute of Architects, and associate of the

Expansion Historical Association, Nies/Kaiser, Printing Company. This booklet was published after the completion of the construction of the arch.

³⁰Dedication of the Gateway Arch, St. Louis Missouri, May 25, 1968.

National Academy of Design; Charles Nagel, Jr., of Brooklyn, New York, member of the American Institute of Architects, and director of the Brooklyn Museum; Richard Joseph Neutra (1892-1970) of Los Angeles, California, member of the American Institute of Architects, and chairman of the California State Planning Board; Roland Anthony Wank (1898-1970) of New York, New York, member of the American Institute of Architects, and consulting chief architect for the Tennessee Valley Authority; and William Wilson Wurster (1895-1972) of Cambridge, Massachusetts, member of the American Institute of Architects, and dean of the School of Architecture and Planning of the Massachusetts Institute of Technology. Wallace K. Harrison, originally on Howe's list of jury members, sent a telegram on February 27 to Howe informing that the United Nations decided he could not work as a jury member. Thomas C. Vint, on Howe's list of March 12, did not make the final selection.

Howe prepared the competition program. The competition was organized as a two-stage affair. It was open to every U.S. citizen who considered himself an architect by "education or experience."³¹ The deadlines for submission were subsequently set for September 1, 1947, and February 3, 1948.

The importance of this competition for the American architectural scene at that time can be assessed by the publicity before the competition. On January 28, 1947, the association announced the retaining of George Howe as the professional adviser to daily newspapers in St. Louis and East St. Louis, and to the Associated Press, United Press, and International News Service.

³¹Program, p. 7, JNEM.

On February 24, it announced that the competition had been endorsed by American Institute of Architects. The detailed announcement of the competition, with accompanying photographs, was released to all major newspapers of the United States, more than 70 magazines and trade publications, and college publications on March 26, 1947.³² On April 10, the list of jury members was published in St. Louis newspapers, The New York Times, and others. The association released at the end of May the localized lists of registered competitors and a story based on the competition program for features to more than two hundred newspapers nationwide.

Interested architects were expected to send a letter of application.³³ Many architects from all over the United States asked for application forms and registered to enter.³⁴ Many entries resulted from the collaboration of an architect, a sculptor, a painter, and a landscape architect. The competition program recommended, though it did not require, each competing architect associate himself with such professionals.³⁵ The professional adviser wrote

³²"Report on Promotional Program for Jefferson National Expansion Memorial Association, February 15 - May 30, 1947," executed by Thomas W. Parry and Associates, JNEM.

³³Eero Saarinen's application, JNEM.

³⁴According to "Report on Promotional Program for Jefferson National Expansion Memorial Association, February 15 - May 30, 1947," 1,123 requests for application forms and at least 605 application received. There is a discrepancy between this record and another, which states that registration was done by 235 groups.

³⁵"Architectural Competition for the Jefferson National Expansion Memorial," p. 7, JNEM.

after the competition that the value of such collaboration in the arts was what was learned from this competition.³⁶

The entries totaled 172. The five teams who were selected to compete in the second stage were, in addition to the Saarinen team; Harris Armstrong; the team of Gordon A. Phillips, William Eng, and George Foster; the group of T. Marshall Rainey, John F. Kirkpatrick, Robert A. Deshon, John B. Sheblessy, Julian F. Bechtold, Thomas Ky, and Robert S. Robinson; the team of N. Breger, Caleb Hornbostel, George S. Lewis, Allan Gould, Andrew Schwob, Donald L. Kline, Ralph J. Menconi, and Christopher Tunnard (see figs. 24-44). Three additional teams were selected as alternates: They were the group of Percival Goodman, Jacques Lipchitz, Mitzi Solomon, Ben Zion, and Paul Goodman; the group of Pilafian and Montana, Samuel A. Cashway, Henry Bernstein, Edward A. Eichstedt; and the group of Hugh Stubbins, Jr., and G. Holmes Perkins (see figs. 45-50). Among the notable entrants who did not make it past the first stage were the team of Eliel Saarinen; Charles Eames³⁷; The Architects Collaborative³⁸;

³⁶Howe, "A Lesson from the Jefferson Memorial Competition," in Journal of the A.I.A., March 1951, pp. 116-119.

³⁷Charles and Ray Eames and John Entenza.

³⁸Namely, Benjamin Thompson, Jean Bodman Fletcher, Norman C. Fletcher, John C. Harkness, Sarah Harkness, Walter Gropius, Robert S. McMillan, Louis A. McMillan and Leonard J. Currie. The painter and design collaborator of the team was Zanti Schawinsky; sculptor, Bruno Innocenti; and museum consultant, Alexander Dörner.

Louis I. Kahn; Tech Associates³⁹; the office of Skidmore, Owings and Merrill⁴⁰; and Harry and John Weese (see figs. 51-64).

The winning design by Eero Saarinen's team revolved around a monumental arch overlooking the Mississippi. The result received national attention. The competition designs were exhibited immediately after the final result in Old Courthouse between February 20 and March 20, 1948. Between May 20 and June 12, the Architectural League of New York held an exhibition based on it. The American Institute of Architects showed the designs at the annual convention, which was held for four days from June 22 in Salt Lake City, Utah. It became known as "Gateway to the West," and following completion of the construction in 1966, after Saarinen's death in 1961, it has attracted admirers and tourists from all over the world.

Eero Saarinen's career

This competition played a significant role in Eero Saarinen's career. Indeed, professionally, it marked his coming of age.

He was born on August 20, 1910, the second child of architect Eliel Saarinen and artist Loja Saarinen. After graduating in 1934 from the School of Architecture at Yale with a Bachelor of Fine Arts degree, he traveled in

³⁹Tech Associates, Snake Hill Road, Belmont, Mass. Architect, Carl Koch; city planner, Arthur McVoy; painter, Karl Zerbe; sculptor, Peter Abate; and associate architects, Frederic L. Day, Joel Leon Lipschutz, Julian Underwood, and Suzanne Underwood.

⁴⁰Designers: Irving Hugh Merritt and George R. Nishikawa. Sculptor: Milton Hebard.

Europe on a Charles O. Matcham Fellowship until 1936.⁴¹ Saarinen worked in the office of Norman Bel Geddes in New York for four weeks in the 1930s.⁴² With the exception of projects for the Office of Strategic Services in 1944-1945, done in a house in Georgetown, Saarinen worked with his father, Eliel Saarinen, from 1936 to 1950, in the office of Saarinen Swanson and Saarinen at the Cranbrook Academy of Art in Bloomfield Hills, Michigan.⁴³ In the spring of 1947, the office changed its name to Saarinen, Saarinen, and Associates.

This competition was one of the first project that Saarinen undertook independent from his father. Indeed, because the father was then more prominent than the son, and because Saarinen had entered other competitions as a member of his father's team, Eliel rather than Eero was briefly declared a winner of the first stage in a now famous error.

Eero Saarinen wrote Howe on April 14, 1947, requesting application forms.⁴⁴ He submitted an application on May 6 in the name of Saarinen Swanson and Saarinen, and at the same time asked for one or two more application forms, for it was his intention to submit a number of entries.⁴⁵

⁴¹Eero Saarinen on His Work, a selection of buildings dating from 1947 to 1964 with statements by the architect, edited by Aline B. Saarinen (New Haven and London: Yale University Press, 1968, Revised Edition), p. 114.

⁴²McQuade, Walter, "Eero Saarinen, A Complete Architect," in Architectural Forum (April 1962), p. 104.

⁴³Ibid.

⁴⁴Letter from Saarinen to Howe, dated April 14, 1947, JNEM.

⁴⁵Letter from Saarinen to Howe, dated May 6, 1947, JNEM.

Two entries were submitted by the office in the first stage, numbered 144 and 147. Both bore the group name of "Architects: Saarinen, Saarinen & Associates, West Long Lake Road, Bloomfield Hills, Mich." It was only after the group was broken down to individual names that the difference could be discerned. The authors of scheme no. 144 were Eero Saarinen, J. Henderson Barr, Dan Kiley, Alexander Hayden Girard, and Lily Swann Saarinen, and those of no. 147 were Eliel Saarinen, designer, and J. Henderson Barr, associate designer.⁴⁶

The telegram from the professional adviser, announcing the results of the first stage, was addressed to Eliel and notified him that he had won. A letter followed to correct the mistake.⁴⁷

Eero Saarinen was a frequent entrant of competitions, and he often won. Before the 1947 competition, he had entered the competition to design an art center for Wheaton College in 1938, and won one of the four fifth prizes.⁴⁸ In 1939, he and his father had taken the first prize in the competition for the Smithsonian Art Gallery (fig. 65).⁴⁹

⁴⁶List of 1947 JNEM Memorial[sic] Competition, JNEM.

⁴⁷Telegram to Eliel from Howe (September 26, 1947), announcing Eliel to be a finalist and letter from House to Eero (September 29, 1947), correcting the mistake. (JNEM). According to J. Henderson Barr, who was in the office of Saarinen and worked both on Eero's and Eliel's competition entries, the night the telegram came, they had a great celebration with Schnaps, a Finnish tradition. When Eero learned about the mistake, he worried about how he was going to tell his father. When he eventually told him, Eliel's response was "Wonderful! Let's have another celebration!" (Letter from J. Henderson Barr to the author on May 9, 1991)

⁴⁸Robert Stern, George Howe: Toward a modern American Architecture (New Haven: Yale University Press, 1975), p. 175.

⁴⁹"Smithsonian Competition," in Forum 70 (June 1939), p. 28.

Availability of the Drawings

When one decides to choose drawings as the material for research, their availability often becomes problematic. According to Levine, the interest in architectural drawings and their preservation is a rather new phenomenon. In the case of the drawings of the Ecole des Beaux-Arts, for example, the first occasion to study the drawings themselves—and not their reproductions—was the exhibition, organized by Arthur Drexler, held at the Museum of Modern Art in New York in 1975.

Before that, the study of Grand Prix designs was usually based on published documents. The premiated projects of the late 18th and early 19th centuries were available in the form of engravings, and the 19th-century winners, from 1823 on, were even more easily available in the photographic reproductions published by Guerinot. But the earlier engravings reduce all the lusciously washed renderings to thin abstract lines on folio-sized paper, and the later, smaller, mass-produced photographic images give even less idea of the scale, clarity and punch of the originals.⁵⁰

According to Howard Burns, the lack of preservation of Palladio's sketches is due to the architect himself, his surviving family, and later collectors.

Silla Palladio, Giacomo Contarini, Inigo Jones, John Webb, John Talman and Lord Burlington doubtless valued studies of the antique and finished drawings more than the rough sketches on which they were based, and may have been careless or indifferent in their preservation of the latter. It may also be that many rough sketches were simply thrown away by Palladio himself. ... Palladio as a working architect (and as the author of architectural books) needed to preserve his drawings from the antique and his finished project drawings carefully:

⁵⁰Levine, "The Competition for the Grand Prix in 1824: A Case Study in Architectural Education at the Ecole des Beaux-Arts," p. 67.

these contained his repertory of motifs and the suggestions for new designs, whereas he would have regarded his first scribbles only as reflections of them, or preparations for them.⁵¹

Competitions, by virtue of the public interest they attract, are usually well documented in professional magazines as well as common newspapers. Such was the case in the Jefferson National Expansion Memorial Competition.

However, it is not sufficient for this research to have the records in publications. It is necessary to observe the original drawings to be able to discuss their qualities to the degree that this research requires, which one might miss by looking at the reproduction of the drawings in publications. It is not easy task to find a competition whose original drawings are in this condition.

For the sake of convenience, only competitions held in the United States were examined. The competition has been an important method for selecting a design for buildings all over the world, and the United States is no exception. A significant number of notable buildings, both public and private, have been the result of competitions. Among them are the Capitol, the White House, and in the private sphere, the Chicago Tribune Building. Although one finds documentation of such competitions in contemporary publications, the original documents, especially the drawings, have rarely been kept.

The case of the Jefferson National Expansion Memorial Competition is comparatively rich in terms of records, for the association that was formed

⁵¹Burns, "The Lion's Claw: Palladio's Initial Project Sketches," p. 73

specially to hold a competition has continued to exist to date, as the Jefferson National Expansion Historical Association. Their archive possesses three of the four submission sheets produced by the Eero Saarinen team. It not only has the documents related to the winning design, but most of the other entries in the competition, as well as records and correspondence before, during, and after the competition up to the completion of construction.

For this research, it is important to include the drawings produced before the submission drawings. It is quite rare to be able to secure such drawings.

In the case of Eero Saarinen's design, twenty-one drawings from the two competition stages have survived. No study models exist, despite the fact that Eero Saarinen produced a large number of models and drawings while designing. Indeed, working with a model was an important part of Saarinen's usual method of design.

Mock-ups and model techniques, which since World War II have become the mode of the modern, major American architect, owe a good deal to the Saarinen office. The mock-ups were full-scale sections of buildings completed to test the technical advances. The models, such as CBS, were not only for demonstrating the design to clients, but for determining it. One afternoon, for example, a number of the collaborators on Lincoln Center held a meeting at the Saarinen office and talked about revising the site plan. Saarinen had six designers standing by, and whenever a suggestion was developed in the committee, one designer would dart out, make a massing model and return in minutes. That afternoon settled a great many things.

As Saarinen's models got bigger and more complete, the sketches got faster and more basic; but the ideas were in them.⁵²

⁵²McQuade, "Eero Saarinen, A Complete Architect," p. 113.

Saarinen is also known to have made a great number of sketches.

He uses [an] unbelievable amount of sketching paper ...
At [sic.] one evening he can use up to 50 meters of paper.
Designing a plan for [the] Embassy in London he executed
more than 2,000 drawings.⁵³

Unlike some other architects, he was not particular about the kind of paper used for sketches. He "reaches for the nearest napkin or note pad," it was remarked.⁵⁴ He was known to use any paper available in meeting with his client. The reason that few sketches survive seems to be that Saarinen did not particularly regard drawings and models as things to be kept for record. Perhaps the most telling comment was this: "He talked with pencil."⁵⁵

Another reason for the loss of primary sketches and models is that the office of Eero Saarinen moved several times. In 1950, the year of his father's death, Saarinen established his own office, Eero Saarinen and Associates, and moved to Birmingham, Michigan. The project for the Jefferson National Expansion Memorial was still in going on when he made this move. Another move was interrupted by Eero's sudden death in 1961, following surgery for brain cancer at the Medical Center of the University of Michigan. This occurred right after he completed arrangements for a move from Michigan to Connecticut.⁵⁶ His associates, Joseph N. Lacy and John

⁵³Rich Lopacki, trans., "Architect Eero Saarinen," Yale University, Manuscripts and Archives, New Haven, CT. (Yale hereafter).

⁵⁴"The Maturing Modern," in Time, July 2, 1956, p. 50.

⁵⁵Eero Saarinen, *Architect (1910-1961)* [motion picture] (New York and Bloomington, IN: Center for Mass Communication, Columbia University Press, and Indiana University Audio-Visual Center, 1967)

⁵⁶McQuade, "Eero Saarinen, A Complete Architect," p. 104.

Dinkeloo, and Chief Designer Kevin Roche, reopened the office, in Hamden, Connecticut, which later changed its name to Kevin Roche John Dinkeloo and Associates, to complete the number of projects that were left by Saarinen, including the construction of the Jefferson National Expansion Memorial.⁵⁷

The one submission drawing missing from the Association collection can be viewed in the original at the office of Kevin Roche John Dinkeloo and Associates. The submission sheet was actually a photographic reproduction of this original sheet. The office possesses nine more drawings, including the mylar drawing that was an overlay of the sheet of plan, section and elevation for the second-stage and others drawn in preparation for the submission sheets. Additionally, seven other drawings are available, although only as reproductions in publication, in an issue of Progressive Architecture. Originally nine sketches of plan or elevation and seven perspectives were sent to the publisher for publication with Saarinen's short comments on each drawing. Only seven out of the sixteen were reproduced in the magazine. The other nine can only be conjectured from the written comments of the architect. Lastly, one letter of Saarinen's, to J. Henderson Barr, a team member and the assistant architect, contained two rough sketches of plans.

⁵⁷Eero Saarinen on His Work, a selection of buildings dating from 1947 to 1964 with statements by the architect, edited by Aline B. Saarinen (New Haven and London: Yale University Press, 1968, Revised Edition), p. 114.

Of the seventeen drawings, in addition to the four submission drawings, eight were drawn in the first stage, and nine were drawn in the second stage.

CHAPTER III

EERO SAARINEN'S FIRST-STAGE DESIGN

Initial Ideas and Influences

Before attempting to reveal how drawing contributed to Eero Saarinen's design for the Jefferson National Expansion Memorial Competition, it is necessary to examine the context so that any other factors which may have generated the design may be identified.

Competition Program

In a competition, the program is generally the chief influence on the design. Given the strictly limited communication with the jury, whose approval is necessary for success in a competition, the competitors in principle take the program seriously. In this particular competition, when a competitor wanted to know what the jury was looking for in a design, he had to rely primarily on the program. The jury, after all, was supposed to base its judgment on the requirements stated in the program. Before submitting a design, the architect was initially restricted to the information contained in the program. However, provision for questions from the competitors, under strict limitations, was made. When a competitor needed any additional information, he had to request it anonymously, and the answer was sent to all registered competitors.¹ The submissions were also

¹"Architectural Competition for the Jefferson National Expansion Memorial Program," p. 8, JNEM.

kept anonymous until after the completion of the second stage, except that the winners of the first stage were identified to the adviser, the president, the treasurer, and the chairman of the competition committee of the association. The jury members remained in the dark concerning the authors of the entries.²

Losing competitors tended to blame themselves. Soon after Louis I. Kahn learned of his failure in the first stage of this competition, he wrote to Saarinen and said he regretted that he had been unable to follow the program well enough. Kahn wrote to Saarinen on October 21, 1947 from Yale University, where he had started to teach the same year:

Dear Eero

Am writing from Yale where I am finishing the last week of work. [Harold] Hauf, the director [chairman] of Architecture is determined to make the school the best in the country and is therefore open to suggestions on any resolution any ideas which promise to develop better students and better architecture. Hauf sends his personal regards and is sorry you can't make it this year—but being your Alma Mater why not venture some of your ideas in writing and forward to the chief?

I have never been able to read a program properly nor finish in grand style and for the latter reason have no photographs of my solutions.³ (Underline mine)

The program was written by George Howe, the professional adviser, and mailed to the registered competitors on May 30, 1947.⁴ The program

²Ibid., pp. 7-8.

³Letter from Kahn to Eero of October 21, 1947, received on October 23, 1947, Eero Saarinen Archive, Kevin Roche John Dinkeloo and Associates, Hamden, CT. (KR hereafter).

⁴Program, p. 7. In writing the program, Howe referred to A.I.A. guidelines, the Wheaton College competition, and program drafts produced by the association.

specified, among other things, the site for the design, the design requirements, and the drawings required for submission.

COMPETITION SITE: TWO-STAGE STRUCTURE

The program was divided into two stages in part to deal with an ambiguous site. Among the specifications in the program, the site was the least well defined. This resulted, the program admitted, from having four different legal entities involved in the area:

A conflict exists, in a healthy sense, between the purposes of the U.S. [Territorial Expansion Memorial] Commission [created by joint resolution of the Congress, June 15, 1934], of the City [of St. Louis], of the [National] Park Service [of the Department of the Interior], and of the Association.⁵

The primary purpose of each entity was described as follows:

The purpose of the U.S. Commission to formulate plans looking to the creation of a Memorial, of the City to assist in creating the Memorial and to make certain that the throngs who will visit it from all parts of the world are provided with sufficient parking facilities and conveniences in a location where existing provisions are already inadequate, and of the Park Service to preserve an Historic Site within the meaning of the [Historic Sites and Buildings] Act [passed by the Congress, August 21, 1935], are separate and distinct in legal theory, while the present purpose of the Association to create a Living Memorial to the vision of Thomas Jefferson in the form of Continuing Activities is a private concern and without legal sanction of any kind.⁶

However, the program stressed the commonality the four possessed.

⁵Ibid., p. 4.

⁶Ibid.

...in reality all four have a common purpose, namely to develop an historic metropolitan area to the greatest advantage of the citizenry of the world at large.⁷

Based on this condition, the program defined the "historic" site and the "program" site. The "historic" site was "the area adjacent to the shore of the Mississippi River," which was "acquired and cleared by the National Park Service pursuant to an Executive Order issued by the President [of the United States] December 21, 1935," and "one block to the west of it, on which stands the Old Courthouse, donated to the Government by the City." The "program" site was larger than the "historic" site by "the addition of certain building and areas not owned by the Government, namely, the Old Cathedral, the Levee, an area situated in the State of Illinois, on the east bank of the Mississippi River opposite the Historic Site, and any contiguous areas that it may seem appropriate to consider in relation to the ultimate development of the Memorial."⁸

The program stated that the "historic" site consisted only of that portion "under the jurisdiction of the Department of Interior," and "any plan recommended to that Department for execution must ... be confined to the Historic Site." Nevertheless, the federal government, the city, and the association recognized the importance of integrating all the other parts of the "program site" in the memorial.⁹

⁷Ibid.

⁸Ibid., "Definitions of the Terms Used in This Program," no page number.

⁹Ibid., p. 13.

Howe made the competition a two-stage affair partly because he wanted to invite designs that imaginatively integrated the larger site in the first stage and let the finalists come up with legally workable schemes later. According to Robert A. Stern:

The two-stage competition reflected his belief in the complementary but discrete roles of "imagination" and "intellect" in architectural design in particular, and in the creative process in general. In the first stage, the entrants were exhorted to "give their imaginations free rein, leaving the examination of what really can be done to a less exuberant moment."¹⁰

This notion was precisely described in the program:

THE FIRST STAGE of this Competition is given over to a study of the Program Site as a whole and of such specific requirements as can be established at the present time. It is designed to explore the relationship of the Historic Site to the urban area and the region of which it is a part and the integration in a single plan of the purposes of the U.S. Commission, the Park Service, the City, and the Association. The requirements outlined below, therefore, apply only to the First Stage.

THE SECOND STAGE will be given over more particularly to the study of a plan for the Historic Site, to be recommended to the Department of the Interior for execution. Addenda stating more specific requirements will be issued to participants in the Second Stage after the completion of the First.¹¹

Whereas the program encouraged the inclusion of the "program" site, the addenda to the program, written by Howe as additional instruction for the

¹⁰Stern, George Howe, p. 207. Howe, "Jefferson National Expansion Competition," Forum 88 (March 1948), pp. 14-18.

¹¹Program, p. 13.

second stage, which will be discussed in the next chapter, directed that the entries were to be confined to the "historic" site.

Saarinen recognized the legal difficulties that Howe faced in writing the program. On February 26, 1948, after winning in the second stage, Saarinen expressed to Howe his appreciation for well-written program:

Dear George:

I'm not sure whether this will reach you in Philadelphia or will be forwarded to Rome, but I would like to express some of the thoughts I have had about all your work on the Competition.

I think you have done a masterful piece of work. I may be biased because of the outcome; but had it been different, I would have the same opinion. The program that you wrote is the best competition program I have seen. The job must have been a difficult one because of all the political intricates [sic.], but you used them to open up many avenues and opportunities for the competitors.¹²

Saarinen also wrote to Kahn on the same day, in reply to Kahn's congratulatory telegram:

The one you should congratulate (unless he has already left for Rome) is your neighbor [Howe]. You are familiar with what a fine job he did with the first part of the competition. He may have been a bit discouraged with the scope of the second phase, but I wonder if that was not, at least partly, the inevitable discouragement of an idealist moving from the ideal to a realistic program.¹³

Saarinen even tried to bring back the notion of including the larger area in the project:

I was interviewed by the St. Louis Star-Times (Foster Eaton) and told him about an idea Mr. Fiske Kimball had

¹²Letter from Saarinen to Howe, on February 26, 1948, KR.

¹³Letter from Saarinen to Kahn, on February 26, 1948, KR.

expressed the evening before—that the 1953 Fair be placed on the memorial site and that the monument and other structures be built as part of the Fair. I added to this suggestion that because the memorial site was not big enough for a Fair, the other side of the river could also be included.¹⁴

Quite a few submissions of the first stage included areas outside of the “historic” site. Many entrants envisioned using the land across the Mississippi river, in East St. Louis, in their designs. For example, Eliel Saarinen placed an open air amphitheater, a minor design element called for in the Program, on the east side of the river, with the stage in the river (figs. 51 and 52). Louis I. Kahn is another architect who considered the east bank of the river as an important part of his design, by connecting the two banks by a new bridge (figs. 57 and 58). Eero Saarinen also depicted his proposal for development of the east shore as a part of the park, including the traffic system that connected the two banks, parking areas, sports facilities, boat basins, and play ground (figs. 24 and 25).

Design Requirements

The program sought the following five elements in design. The first was an architectural monument or monuments. The second element was the mandatory preservation of the Old Courthouse and the Old Cathedral and the desirable preservation of the Old Rock House, as well as requiring landscaping, an open air campfire theater, reproduction of small buildings typical of St. Louis of earlier days, and a museum or museums.¹⁵ The

¹⁴Letter from Saarinen to Howe, on February 26, 1949, KR.

¹⁵Howe recommended an open air theater elsewhere.

program contained drawings of the Old Courthouse, the Old Cathedral, and the Old Rock House. The third requirement was the creation of a living memorial to the vision of Thomas Jefferson "in the form of a continuing activity or continuing activities." The fourth was to develop the recreational possibilities of the program site. Fifth was the provision of car access and parking, relocation of railroad tracks and the interstate highway.¹⁶ The program included a diagram suggesting the future relocation of the railroad and highway.

Drawing Requirements

The program's specification of the required drawings in the first stage may also have influenced the submissions of the competing architects. The level of drawing determined the level of design development, and the architects paid more attention to those design elements singled out in the drawing guidelines.

Two sheets, termed sheets A and B, were required in the first stage. Sheet A, or "the Presentation of the Design,"¹⁷ was to be a monochrome drawing on a sheet of white cardboard, or white paper mounted on cardboard, approximately thirty-six inches high and forty-eight inches wide, and to include plan, elevation, and cross-section(s) at the scale of one inch to one hundred feet. Sheet B, or "the Explanation and Amplification of the Design,"¹⁸ was to be any kind of color drawing on a sheet of cardboard or

¹⁶Program, p. 14-15.

¹⁷Ibid., p. 25.

¹⁸Ibid.

paper mounted on cardboard, of the same size as sheet A. It had to include a perspective of the historic site and surrounding area, a cubage diagram of the museum, sketches of the monument and the museum, designs for sculpture and painting, and a depiction of the underground parking structures with typical access and space arrangements. The program encouraged the entrant to consider the second sheet as "talking to the Jury over the drawing board, pencil, pen or brush in hand, making freehand sketches to explain and amplify any ideas, features, compositions or details he may think especially worthy of their consideration or necessary to clarify his thought."¹⁹

The influences of the above specifications on the program, and on the categories of the site, the design elements as well as the types of submission drawings, will be discussed in detail as they appear in the examination of the drawings in a later section of this chapter.

Professional Adviser and

Jury Members

In designing for a competition, Eero Saarinen's first strategy was to study the jury. According to Walter McQuade, who studied Saarinen's strategy in winning second place in a 1960 competition sponsored by the World Health Organization, Saarinen always asked "Who is the strong man?" and "What will stimulate him?"²⁰ In the case of the Jefferson

¹⁹Ibid.

²⁰McQuade, "Eero Saarinen, A Complete Architect," p. 111.

National Expansion Memorial Competition, George Howe, the professional adviser, was "the strong man."

That George Howe was the professional adviser confirmed, at least partially, the type of design sought by the association. He described himself as "a veteran of the Beaux-Arts who has come through the conflict pretty badly cut up but not decapitated."²¹

His well-known interest in the capabilities for monumental architectural expression within an acceptable modern design vocabulary and his position as a modernist acceptable to the Beaux-Arts establishment, which even in 1948 was still very much in control, made him the logical choice for the job.²²

His strong interest in monumental architecture was well-known. For example, Howe wrote in 1945 that, if the spirit of America were to meditate on the nature of a monument for mankind, then productivity would be the meaning of the monument:

To give my meaning substance a pyramid might well be the simplest and most stable shape familiar to all men and common to all cultures and the plan of the pyramid might take the form of the five-pointed star which is the symbol of our unity, with steep shining arises and sharply shadowed returns. I [the spirit of America] might build it of polished granite in huge blocks of blended colors drawn from every quarry in the land and it should be greater than any pyramid ever built, not for the pride of a tyrant in the labor of his slaves but for the pride of the power of a free people which is one with me, the Spirit of America, in a sense in which perhaps no other people has even been one with the spirit of a nation. The pyramid should stand as long as men shall endure as evidence of my

²¹Stern, p. 199 and note 20.

²²Ibid., p. 206.

undertaking that no other monument shall ever be built in memory of war.

If I built such a monument I might build it in an amphitheatre of rocky eminences and on their sides I might set tiers of seats and terraces for multitudes and I might raise it on a vast stepped platform approached by highways from every side. In the midst of the steps I might set a great stone and on the stone I might engrave these words:

ERECTED BY US THE PEOPLE, THE HUSBANDMEN, ARTISANS AND ARTISTS OF THE UNITED STATES OF AMERICA, IN A MOMENT OF REST AFTER BATTLE, TO COMMEMORATE AN INTERLUDE IN WHICH WE TURNED FROM OUR PREDESTINED TASK OF FREEING MAN FROM THE FEAR OF WANT, WHICH HAS BLIGHTED HIS SPIRIT IN THE DAYS OF ITS FLOWING, TO DIE AND LABOR AS FIGHTERS AND AS WORKERS TO FREE MAN FROM THE FEAR OF MAN FOREVER.²³

George Howe had in 1938 entered the Wheaton College arts center competition, sponsored by the Museum of Modern Art and Architectural Forum. "This was the first time that an established American institution of higher learning was willing to experiment with modern architecture outside of the classroom; for the first time, a competition was organized with the intent of producing a modern building."²⁴ The invited competitors included Walter Gropius and Marcel Breuer, William Lescaze, and Richard Neutra. The first prize went to Caleb Hornbostel and Richard Bennett, second to Gropius and Breuer. Howe received the fifth prize, along with Eero Saarinen, Percival Goodman, and the firm of Lyndon and Smith. In the next year, Howe served the federal government on the jury for the ill-

²³Howe, "Memorials for Mankind," in Architectura! Forum (May 1945), p. 124. see also "War Memorials," Forum 91 (Dec. 1949), p. 100.

²⁴Stern, p. 175.

fated Smithsonian competition, along with John A. Holabird, Henry R. Shepley, Walter Gropius, and Frederic A. Delano.²⁵ Eliel and Eero Saarinen, in partnership, won the first prize, although their winning design was never built. In 1942 Howe was appointed Supervising Architect of the Public Buildings Administration. He also served on advisory committees at Harvard University, the University of Pennsylvania, Princeton University, and the California Institute of Technology.²⁶ The institutions' trust in George Howe as a successful teacher, writer and creator made him a Fellow of the American Institute of Architects, the first modernist among them, in 1943.²⁷

The members of the jury listed in the program only reconfirmed the association's preference for monumental design in modern vocabulary.²⁸

Louis Kahn on Monumentality

Louis I. Kahn's association with George Howe may have made Saarinen particularly interested in Kahn's idea for a monument. Howe became associated in a practice with Kahn in 1941. Although Howe left the

²⁵Ibid., pp. 174-175, 206-207.

²⁶Stern, p. 199, no. 20.

²⁷Ibid., p. 208.

²⁸Fiske Kimball had been a member of Thomas Jefferson Memorial Commission since 1935. He wrote in his support of John Russell Pope's design for the Jefferson Memorial in Washington, D.C., "I am very sympathetic with the effort to end the 'petrified forest' of columns in Washington, but I feel, in view of Jefferson's own strong feeling about the classic, that the Jefferson Memorial is not the place to begin. Let us carry out the proposal for the Memorial ... and then let us turn to the task of infusing the architecture of Washington henceforth with modern character." in *Magazine of Art* (May 1938). The influence of the Jefferson Memorial on Saarinen's entry will be discussed later in this chapter.

office in February of the next year to take up his governmental duties in Washington, D.C., his name remained connected with the firm for some time.²⁹

In the letter quoted above,³⁰ in which Kahn said he regretted not having followed the program, he congratulated Saarinen for his success in the first stage. Kahn explained that he had chosen "A Laboratory of Education" as his theme, but had injected so many ideas as to create a fragmentary design. Even more interesting, Kahn said he wished he had developed a design based on sketches which he had shown to Saarinen earlier:

I should have started this letter to congratulate you which I do and hope honestly that you come out in top in the finals. From what I have heard of your scheme and adding my intuitive deductions I guess you have a kind of statue of (Jefferson Democracy Liberty) with added building or buildings (related) to be used by people in developing the extension of the principles of democracy--etc. I forget physical monumentality--I felt that the force should be the kind of work (not the buildings) which would be as strong as to be felt at great distances from the site. I chose A LABORATORY OF EDUCATION as my theme (I developed it rather poorly by injecting too many ideas which made nothing particularly strong and therefore may have appeared fragmentary)

...

Before the program came out a [sic.] ventured many sketches on a small pad which when I look back now are really good and which if I had followed (and not gotten snarled up with traffic and parking) I feel would have created much more interest. You remember the sketches I

²⁹ Scully, Louis I. Kahn, p. 15.

³⁰ Letter from Kahn to Saarinen, dated October 21, 1947, received by the Saarinen office on October 23, KR.

showed you of the steel sculpture—well it was based on that principal [sic.]. Well—I'll wait for the next opportunity—it may come in the next 100 years.³¹

It has not been possible to find the actual sketches of the steel sculpture that Kahn said he showed to Saarinen. However, one can refer to an article by Kahn on monumentality, published in 1944 along with one by Sigfried Giedion.³² In it, Kahn referred to Choisy and reproduced one of Choisy's drawings of Gothic architecture. Kahn's drawings, according to Vincent Scully, "recall those of Le Corbusier, which he apparently often traced in these years, and which themselves owed more to Choisy than either those of the Beaux-Arts as a whole or Kahn's own earlier sketches had done"³³ (figs. 66-68).³⁴ The sketches that Kahn showed Saarinen were probably similar to those that accompanied this article. The observation of Kahn's entry (figs. 57 and 58) confirms that, although Kahn had this design vocabulary in his 1947 entry, the steel sculpture was not a dominating element, being employed in small-scale in an open space and in structural frames to support a museum space.

Saarinen might, consciously or unconsciously, have remembered Kahn's idea for a monument in designing his own entry for the

³¹Ibid.

³²Kahn, "Monumentality," in Paul Zucker, ed., New Architecture and City Planning. A Symposium (New York: Philosophical Library, 1944), pp. 577-588. See David Brownlee, Louis I. Kahn: In the Realm of Architecture (New York: Rizzoli, 1991), pp. 42-44.

³³Scully, Louis I. Kahn, p. 16.

³⁴Ibid., plate 15.

competition. The drawing may have left a stronger impression than the writing.

It is not possible to associate Saarinen's competition design directly with Kahn's sketches. The form of the dome or arch is so common that one can never argue that the idea of the arch as the monument was borrowed directly from Kahn.³⁵ Saarinen might have come up with the idea anyway, even without seeing Kahn's sketch.

Saarinen did not speak of Kahn's sketch as an influence in his design. According to an article Saarinen wrote after the competition, the arch design originated from a dome, and it was only after they had the idea that they examined it against past examples of arches, among which were the hangars at Orly by Eugène Freyssinet, the concrete bridges by the Swiss engineer Robert Maillart, and Le Corbusier's competition design for the Palace of the Soviets. He also cited the wooden arches he and Eliel Saarinen had used for the summer opera house at the Berkshire Music Center, at Tanglewood, Massachusetts, which they designed in 1944 (figs. 69-70).³⁶

³⁵Because the form was so common, an objection was made right after the announcement of the final result by Gilmore D. Clarke, New York architect and the chairman of the National Commission on Fine Arts Commission. Clarke wrote to Wurster on February 24, 1948, criticizing the winning design for its close resemblance to the arch proposed for the international exposition in Rome in 1942. "The pertinent question is not whether or not the design was plagiarized; rather it is whether or not, in the circumstances, it is appropriate to perpetuate the memory of Thomas Jefferson and to memorialize the Louisiana Purchase by constructing a monument similar in design to one originally created to glorify twenty years of Fascism in Italy!"

³⁶Saarinen, "Saarinen Tells How 'Gateway' Was Conceived" in Saint-Louis Post Dispatch (March 5, 1948, Part 5), p. 1.

Three Previous Designs for the St. Louis River Front

Among the previous proposals for the same site, three should be given attention, for there is a good chance that Saarinen would have been familiar with these three schemes, and that they may have had some influence on his design conception.

City Plan Commission (1928)

In 1928 the City Plan Commission published "A Plan for the Central River Front" and proposed a design for the central river front area of St. Louis, by Harland Bartholomew.³⁷ Hugh Ferriss worked at delineating the design. (fig. 71). The City Plan Commission also had Victor Berlendis, an "Architectural Sculptor," make a model of the same design, whose photograph was also included in the publication³⁸ (fig. 72).

As E. J. Russell, the chairman of the City Plan Commission, stated in the above-mentioned publication, Ferriss was a native of St. Louis, graduated from Washington University in 1911, and, in the year of this design, he had already become famous as a commercial delineator, who was hired solely to render other people's building projects.³⁹ Ferriss became well-known for his New York zoning study that he did in collaboration

³⁷"A Plan for the Central River Front," City Plan Commission Harland Bartholomew, Engineer, 1928, JNEM. Hugh Ferriss expressed his satisfaction with the result of the competition.

³⁸"Some Aspects of the Planning of the Jefferson National Expansion Memorial," prepared by Daniel Cox Fahey, Jr., February, 1937, Revised July 1937 and October 1937, plate XVIII.

³⁹Ferriss, "Re Renderings," in Pencil Points (July 1940), pp. 400-430.

with the prominent New York architect and skyscraper designer, Harvey Wiley Corbett. It was exhibited first in February 1922 at the Architectural League of New York and later in other cities, including Chicago and Detroit, and published in the New York Times Magazine of March 19, 1922.⁴⁰ Ferriss held an exhibition called "Drawings of the Future City" in a New York gallery in April 1925.⁴¹ In 1928 he wrote the entry under the heading of "rendering, architectural" for the fourteenth edition of the Encyclopaedia Britannica.⁴²

The plan was greatly concerned with the traffic system. It provided for a number of new elevated streets, including a highway. The lower levels of these streets were to be used as public parking spaces and garages, subway terminals, and the like.

The background, on the drawing and the model, of the proposed traffic system consisted of a number of high rises, located across the street from the river front site, in the style commonly seen in that era, massive buildings that were tapered by setbacks, with vertical recesses in which narrow windows were placed.⁴³ The design was much in accordance with the ideas that were shared by Eliel Saarinen's famous design for the Chicago Tribune competition of 1922, the Lake Front project of the City of Chicago of

⁴⁰Carol Willis, "Drawing towards Metropolis," in Hugh Ferriss, The Metropolis of Tomorrow (Princeton: Princeton Architectural Press, 1986), pp. 156-8

⁴¹Ibid., pp. 152, 162-64.

⁴²Ferriss included Eliel Saarinen's perspective drawing for the Chicago Tribune competition in this article.

⁴³Although it is out of scope of this study to prove, this style started in the States with Eliel Saarinen's entry for the Chicago Tribune competition in 1922, for which the architect received the second prize.

1923, and Hugh Ferriss' studies of the New York zoning envelope of 1922 (figs. 73-75).

Saarinen might have had knowledge of the 1928 proposal through his professional association with Hugh Ferriss. The office of Eliel and Eero Saarinen hired Ferriss for the drawing of a project for General Motors in 1945, only two years before the competition (fig. 76).⁴⁴ However, the 1928 proposal did not seem to have much influence on Eero's 1947 entry. The 1928 design of buildings was outdated by 1947. The traffic system could not have been referred to by Saarinen. The location of the highway the competition program of 1947 suggested was completely different from the 1928 pattern.

Louis LaBeaume (1935)

Another proposal to be noted is one by Louis LaBeaume (fig. 77)⁴⁵. LaBeaume was a prominent architect in St. Louis who in 1935 proposed a large garden, symmetrically arranged around the central axis of the Old Courthouse, and a row of classical buildings, on the city side and a high wall on the levee side to surround the garden. It was much in the Beaux-Arts tradition. Aware of this design or not, Saarinen and his architecture were too different to bear any marks of influence.

⁴⁴Conversation with Prof. Peter Papademetriou, March, 1991, in the office of Kevin Roche John Dinkeloo.

⁴⁵"Thomas Jefferson and the Pioneers to Whom We Owe Our National Expansion," in 1935, presented in *Some Aspects of the Planning of the Jefferson National Expansion Memorial*, prepared by Daniel Cox Fahey, Jr., February, 1937, Revised July 1937 and October 1937, plate XVIII, JNEM.

But LaBeaume had another role to play. In the same year he made his proposal, LaBeaume submitted to Luther Ely Smith his suggestions on the competition, which included that it be a national, two-stage event. His recommendations, submitted on January 19, 1935, were the basis for the program proposed and adopted by the commissions on April 13, 1935.⁴⁶

LaBeaume became a member of the jury for the 1947 competition on the recommendation of the president of St. Louis chapter of American Institute of Architects to Howe.⁴⁷

Jackson Shotwell Armstrong (1944)

Among the designs in the past, the most influential to the Eero Saarinen team was probably the plan by the office of Jackson Shotwell Armstrong. It was published in 1944 in Architectural Forum, one of the most popular professional magazines (figs. 79-80).⁴⁸ Harris Armstrong later entered the competition and was selected as one of the five finalists. Although his own competition design (figs. 29-32) was not similar to his earlier scheme, his 1944 proposal was referred to by a number of entrants in 1947.

⁴⁶Letter of LaBeaume to Smith on January 19, 1935, JNEM.

⁴⁷Letter of March 12, 1947, from Howe to Howard Baer, JNEM.

⁴⁸"Riverfront Reconstruction, St. Louis, Mo.," in the Architectural Forum (April 1944), pp. 111-116. The letter from Saarinen to Kiley (October 16, 1947), discussing the finalists, suggests that Eero knew about Harris Armstrong. "From the way Armstrong talked when I saw him in St. Louis, he concentrates activity, life, and whatnot on the edge of the river[sic]. ... From Lou Kahn I hear indirectly that it is Hornbostel, some unknown, and a group that worked on the development of this site earlier. Whether that means Park Service or what, I don't know."

Saarinen, as well as some other entrants, preserved some elements that appeared in Armstrong's proposal, although they were not required in the competition program: The most notable one is the use of the strip of land between Third and Fourth Streets. Armstrong's scheme used this site to locate hotels, apartment buildings, and commercial office buildings. Saarinen's first-stage scheme included this portion of the land in the design, and provided structures for functions similar to those in Armstrong's proposal.

In addition, Saarinen placed a waterfront restaurant and a river boat terminal, both of which were requested by the program, in locations similar to those in Armstrong's 1944 design. A helicopter landing pad, which was not requested in the program, was adapted by Saarinen from Armstrong's proposal.

Design through Drawing:

This section will examine in sequence the drawings produced during the first stage and determine how each drawing, if at all, generated the design.

Dome to Arch:

From Ambiguous to Specific

Saarinen had been toying with the notion of designing a monument for several years before his entry in the Jefferson National Expansion Memorial Competition, but the idea of an arch did not take shape until the competition was under way. The crucial turn in the creative process that led

to the design of an arch took place not in drawing, but in an intimately related activity: model-making. Thereafter, drawing would play a significant role in the refinement of the arch and other elements in his entry.

Saarinén explained in a newspaper article after the competition the origins of his concept of the monument.⁴⁹ In it, Saarinen said he had been thinking of the possibility of competing to design a "great national monument" for several years before the competition announcement, during the war. Strolling on the Mall in Washington, D.C., probably when he served in the Office of Strategic Services there, he argued with two other architects that a monument's "real purpose" was to remind the people of "the great past, which is so important in relation to looking toward the future."⁵⁰

The competition program called for a monument as one of five design elements. It stipulated that the monument it sought should commemorate the following six groups of historical individuals and incidents:

A monument or monuments will be erected commemorative of Thomas Jefferson; his aides Robert Livingston and James Monroe, respectively the ambassador and the special envoy to the court of the Emperor Napoleon I, who as representative of the United States signed the Louisiana Purchase Treaty on behalf of the Government; the Louisiana Purchase; the Lewis and Clark Expedition, which was outfitted in Old St. Louis; the

⁴⁹Saarinén, "Saarinén Tells How 'Gateway' Was Conceived."

⁵⁰Saarinén served the office of Strategic Services in Washington, D. C., during 1944 and 45.

Trappers and Fur Traders, who channelled the wealth of the Western forests and streams through Old St. Louis; the Pioneer Movement in general.⁵¹

In response, Saarinen seems to have decided to find a basic simple form that had a strong association with Jefferson. To him it seemed that the memorials to Washington, Lincoln, and Jefferson in Washington, D.C., all had distinct geometric shapes: "a vertical line, a cube, and a globe." He wanted his design for St. Louis to have a shape of the same type of form as the Jefferson Memorial in the nation's capital.⁵²

Saarinen's decision to emphasize Thomas Jefferson was along the lines of the program description. The program stated that the purpose of the association was to "create a Living Memorial to the vision of Thomas Jefferson in the form of Continuing Activities."⁵³ As for the other points that the program defined, Saarinen considered them minor elements in his design as, for example, the matters of sculpture and painting.

The team first imagined the monument as a dome but one much more open than the model in Washington. In 1951, Saarinen wrote a letter, comparing the solid and open forms in relation to Jefferson's ideals:

The concept of the arch came, I think, from a certain amount of feeling for Jefferson, although I don't know as much about him as you do. I had the feeling that a monument to him should not be something solid and static but something open—a gateway for wider vistas—because it seems to me that one of his many great qualities was the ability to look toward the future. In that respect, I

⁵¹Program, p. 15.

⁵²Designed by John Russell Pope, and completed in 1943.

⁵³Ibid., p. 4.

have always thought that the Jefferson Memorial in Washington, being round and being based on a round dome, was too inward an expression for him.⁵⁴

"A great pierced concrete dome that touched the ground on just three points"⁵⁵ was proposed.

Beside the dome, the team was concerned with the idea of tree-shaded park. They were so enthusiastic about providing shade to guard against the hot St. Louis summer that they covered as much of the site as possible with a dense forest.⁵⁶

Charles Eames, Saarinen's old friend and fellow designer, who had lived in St. Louis and was familiar with the site,⁵⁷ was asked to come to Bloomfield Hills and consult, because he knew the city well whereas at this time Saarinen had not yet seen the site. Eames and members of the design team gathered at the Saarinen home to brainstorm. A site model was casually made by spreading "on our living room floor the plan of the St. Louis waterfront," Saarinen recalled.⁵⁸ With matchboxes and wooden blocks, they placed a museum on their site.

For Saarinen, anything handy was usable in creating a model. Just as the living room floor was transformed into the site in St. Louis, he once

⁵⁴Letter from Eero Saarinen to Dr. Benjamin Alan Russell of Philadelphia, on June 6, 1951, KR.

⁵⁵Saarinen, "Saarinen Tells How 'Gateway' Was Conceived."

⁵⁶*Ibid.*

⁵⁷One of their collaborations is a competition for a chair design by the Museum of Modern Art in 1941, in which they won a prize. The chair is named the "womb chair."

⁵⁸Saarinen, "Saarinen Tells How 'Gateway' Was Conceived."

took a grapefruit from breakfast to conceive three dimensional forms by carving it out:

one time in the morning Eero took a grapefruit in his hand and began to admire ellipses and parabolids [sic. parabolas]. Afterwards he put the two halves together and took it to his office, in order to use it in the model of an air terminal which he was designing at the time (T.W.A.).⁵⁹

Unfortunately, the model he and Eames made has not survived. As may have been the case with historical drawings produced during the design, Saarinen valued the design drawings or models only as a means to an end and did not have the notion of preserving them. It is difficult to preserve a fragile three-dimensional object like a model, especially one done for study.

In fact, it is doubtful that this model lasted even for a day.⁶⁰ Ironically, this suggests the creative importance of this type of model. It was made with materials available at hand. All components were removable. The model was therefore a genuine study work, in that the architects' spontaneous ideas could be simultaneously made visual and physical in a quick and easy manner. By its nature, this type of model serves to create a design, certainly not to present it at the final stage of design.

Somebody on the team thought of "some great mass of stone pointing west." In fact, a stone slab placed in an east-west direction formed the monument depicted in Eliel Saarinen's design (figs. 51 and 52). Then

⁵⁹Rich Lopacki, "Architect Eero Saarinen," Yale.

⁶⁰The only surviving model for this project is the stainless steel model made after the completion of the design for construction, KR.

Saarinen remembered the concept of the great pierced dome. The dome, however, looked too heavy on the site model, in relation to the long line of the levee. "To place a round thing there would be to lose all relationship with the river. It would not rise up from the levee," he later said in an interview.⁶¹

They tried the same idea of a dome but with the three ribs that came together.

We tried it in a very crude way: the only things we could find to make it with were some pipe cleaners. But the three legs did not seem to fit in the plan, so we tried it with two legs, like a big arch.⁶²

The concept of the arch came into being at this moment, according to Saarinen's recollection. They "struggled to make an arch made out of pipe cleaners stand upright on the plan on the living room rug."

This instance of the transformation from a dome to an arch contains two ways that the medium generates design development. The first is a case of model-making changing an ambiguous idea to a particular one, the second a case of the intermediary product accidentally becoming the ultimate solution.

The idea of the dome did not originate in drawing. It originated in the appreciation of a pre-existing building. This appreciation was focused on a particular property of the structure, that is, a dome. The architect did not intend from the beginning to recreate the specifics of the Jefferson Memorial

⁶¹Allan Temko, interview by, "Eero Saarinen: '...something between earth and sky...'," in *Horizon* (July 1960), p. 79.

⁶²Saarinen, "Saarinen Tells How 'Gateway' Was Conceived."

dome. Instead, the original idea was formulated as the result of abstraction from the specifics of the Washington, D. C., monument, and therefore was inherently ambiguous.

This ambiguous idea of a dome was tested on the specifics of the site, represented by a map of the St. Louis river front on the living room floor of the Saarinen home. There it gained a new set of specifics, being pierced and three-legged.

The characteristic of this transformation lies in the movement from an abstract idea to a specific one. The transformation is, precisely speaking, an elaboration to a fuller state, which will serve here as the definition of design development. The design is "generated," in that a way to develop the design is suggested by the model-making.

The second way of generating design here rests in an accidental product becoming the solution. It is reasonable to assume from the written records that in the process of building a three-legged dome out of pipe cleaners the architects saw a two-legged "dome," or arch, in front of their eyes. Probably, they first bent the three pipe cleaners into shape individually, then joined one with another, and intended to attach the third. Their intention was to make an open dome, and certainly what they anticipated seeing as they pressed the pipe cleaners into shape was a three-legged dome. However, during the process they saw two pipe cleaners form an arch. The two-legged dome is, in relation to the intended outcome, merely an intermediary product, and therefore could have been overlooked. However, it caught the architect's eye as something having its own value.

Although it was not intended as the ultimate goal, the arch, by an accident of design process, became the final product.

The choice of the model-making materials also played a significant, though unintended, role in the design. If the architect had not used pipe cleaners; if he had instead used, for example, a grapefruit or lump of clay, both of which might have been more suitable to make a conventional dome, he may not have had the opportunity to see an arch during the model-making process. However, pipe cleaners were the only thing at hand. In this way, too, this is a case in which accident—the accidental choice of pipe cleaners—led to an unintended design outcome.

After the arch was conceived through model-making, the drawing began.⁶³ Although this was a case of model-making, and one in which the evidence no longer exists, it prefigured the subtler but significant design changes that were to occur through drawing as the competition went on.

Location of the Arch:

Generating Other Alternatives

After settling on the idea of an arch, the Saarinen team considered the possibilities for placing it across the river, with a leg on each shore, and in the water, before they were convinced that placing it on the west bank was not bad after all.

The architect also studied the proportion of the arch. “The arch was still in a crude form,” Saarinen recalled. The team also examined different

⁶³“Comments on Early Sketches on the Jefferson Memorial [sic.] Expansion Memorial Competition, February 26, 1947 [sic.],” KR

ways of creating an arch, by making it close to a semi-circle, which “looked too much like a rainbow,” or trying to make it quite vertical and pointed, which looked “too ecclesiastical.” They finally came up with an arch form “which was neither flat and round nor too pointed.”⁶⁴

At least one drawing preceded the first available one to date, which is termed drawing no. 1 in this study (fig. 81). The comments sent to Progressive Architecture for publication in its May 1948 issue suggest that the team had what they called sketch #1. It was produced sometime before drawing no. 1 (which the Saarinen team called sketch #2. Hereafter, Saarinen’s listings are indicated in text by an S before the reference.)

Drawing no. 1 resulted from the effort to come up with a better alternative, after S-sketch #1 had reduced itself to a unsatisfactory alternative.

In drawing no. 1 (fig. 81), the entire site was organized rather crudely and simply into two distinct elements: A group of high-rise buildings and a park. The high-rises occupied the areas between Third and Fourth Streets, south of Clark Street, and north of Washington Avenue, which connects with Eads Bridge. They were intended to be office buildings, a United Nations complex, and apartment buildings. The park consisted of a low-rise building, designated as a museum, the arch on the levee, and trees covering the rest. The blocks of high-rise buildings were drawn as black rectangles casting long shadows, whereas the low-rise building was a white rectangle with a short shadow. The alterations created a strong visual contrast of the two areas.

⁶⁴Saarinen, “Saarinen Tells How ‘Gateway’ Was Conceived.”

The changes of the design between S-sketch #1 and drawing no. 1 can only be conjectured from the written records. However, the comments strongly suggest that dissatisfaction with the older drawing made the architect regard it as a negative example generating other alternatives.

Although we do not have this drawing to examine, Saarinen's comments clearly state the particular dissatisfaction he felt after viewing this drawing:

[S-SKETCH #1]

This is one of 10 earliest rendered studies (1/2 scale). All the early designs considered were carried to a rendered stage (1/2 of final) so that they could be compared visually.

Criticism: The long mass of the living memorial and particularly its direction competes with the arch. The entrance to the museum is not well related to the city. The white trees look anemic and do not emphasize the forest. The buildings between Third and Fourth Streets look like worms.⁶⁵

Speculating from the above critical comments, four design features can be assumed. The blocks of the United Nations, or living memorial, building were placed parallel to the river. The location of the entrance of the museum dissatisfied the architect. The treed area was depicted in white. And lastly, the high-rise buildings were in the shape of curved blocks instead of rectangles. These unsatisfactory design elements were reworked in drawing no. 1.

As can clearly be seen in drawing no. 1, the unsatisfactory elements were resolved, in accord with the comments that resulted from viewing the earlier sketch. The high-rise buildings were changed to blocks of rectangular

⁶⁵"Comments on Early Sketches," sketch #1.

forms, the United Nations buildings were located perpendicular to the river, the museum entrance faced the widened street, and the trees were rendered in cross-hatching.

In this case, S-sketch #1 helped the architect to itemize the defects in the design. Before drawing, he had not recognized these elements to be problematic issues. By examining the drawing he had produced, he was able to recognize them as the questions that needed treatment. He was then able to focus his attention specifically on these elements. Precisely because they arose as particular issues to be resolved without any foreknowledge on the part of the architect, one may say that the drawing generated the design changes. Here, "changes" are understood differently from "development," in that the former negate the earlier design, whereas the latter elaborates on the earlier design.

The distinction between the medium generating a specific form from an ambiguous one, which I have called "development," and generating a different idea from the original, which I term "change," lies in the question of whether or not the essence of the original idea is retained. In the first instance, as was seen in the elaboration from abstract dome to pierced dome, the architect did not abandon the idea of dome, but elaborated on it. The case here involves changes, in that, for example, the direction of a building was changed from parallel to horizontal to the river, and the corners of buildings were changed from rounded to rectangular.

In the manner that Graves described, S-sketch #1 helped the architect to raise certain questions by letting him recognize dissatisfactory elements.

Most probably, the architect then drew what Graves called a preparatory study in order to address his attention to these questions.

Location of the Arch

Although the final design holds a strong axial relationship with the Old Courthouse, this was not established from the beginning of the design. The idea of placing the arch in relation to the Old Courthouse evolves throughout the competition stages, primarily by drawing.

The United Nations complex was the team's answer to the program's request for a living memorial. The program specified that the living memorial to Thomas Jefferson is the primary objective of the association, and described him as "a statesman and universal genius who looked always to the welfare of mankind in general as well as to that of the citizens of the United States in particular." The appropriate activities could be, according to the program, "to instruct and disseminate information to organized groups, or the public at large, or both, by every means known to the science of education and culture, concerning the latest developments in any or all of the interests of humanity with which he [Jefferson] was concerned."⁶⁶ Judging from what the program suggested, Saarinen's solution of the United Nations seems to have been sound, if not especially courageous.

The idea of the United Nations was kept in the first-stage submission, in which the architect described it as follows:

"The Living Memorial"

The United Nations more than any other force in the world today embodies within its concepts the democratic

⁶⁶Program, p. 23.

ideals of Thomas Jefferson. In its charter he would see great hope for expanding the social economic and cultural frontiers of the world. If he were alive today he undoubtedly would be employing his energy and genius in leading the United Nations through its present problems to man's last and greatest frontier — freedom and education for the whole world ... we suggest therefore that St. Louis, the central city of the Louisiana Purchase and contemporary center of a tremendous agricultural region, might become the site of one of the special organizations now developing within the social and economic council of the United Nations. An appropriate one might be the food and agriculture organization. This should be envisioned as a future directing force of the world's agrarian science. From it would flow information displays and exhibitions to all parts of the world ... The first unit of such a building would contain the major part of the administrative space as well as lecture halls large areas for the display of exhibitions and places for meetings and conventions.⁶⁷

The extension of Clark Street, between the blocks of high rises and the museum, gradually widens toward the river, and creates an emphasis on the plan so as to divide the high-rise area from the park.

In drawing no. 1, (S-sketch #2), the arch bears no relation to the axis of the Old Courthouse. Rather, it is isolated alongside the park at the halfway point. Saarinen expressed a similar criticism of the arch's effect when he saw the drawing:

[S-SKETCH #2]

Criticism: The entrance to the museum was dreamy. The arch looked lone and forgotten on the levee.⁶⁸

⁶⁷First stage, sheet A.

⁶⁸"Comments on Early Sketches," sketch #2.

The next drawing available in the sequence is a sketch of the site plan and elevation (drawing no. 2, fig. 82). Here, the relationship between the arch and the Old Courthouse was first established.

The change in location of the arch was generated by the dissatisfaction in viewing drawing no. 1. The isolation of the arch in that drawing created in the architect's mind the necessity for alternatives. The architect then looked for alternatives that might overcome its defects, in particular, a scheme that did not make the arch look lone or forgotten on the levee. By giving the architect an unsatisfactory visual effect, as quoted above, the previous drawing appears to have fallen into an alternative, and allowed the architect to conceive other, more satisfying alternatives. In fact the location of the arch in drawing no. 2 made the arch the central piece of design, both in plan and elevation.

The characteristic of a drawing generating other alternatives, itself reduced to one alternative, lies in the fact that this generating is based on the architect's dissatisfaction with the design he sees in the drawing. To compare, generating a specifically different reading from the original one does not involve the architect's dissatisfaction with the drawing, but rather the architect's changed interpretation of the same drawing.

As was the case with S-sketch #1, drawing no. 1 helped the architect recognize the location of the arch as an issue to be resolved. In this case, the design changed not by moving from ambiguous to concrete, but by the drawing making itself a mere alternative that led to some particular changes in the design. This is not a case of design development, but rather of design change. The arch was shifted, rather than elaborated, between this drawing

and the next. Nevertheless, since the location of the arch arose as a design issue from the drawing, the change is an instance of drawing generating design.

Underground Museum

The museum in drawing no. 2 is placed underground. This idea was first depicted in a drawing produced just after drawing no. 1 and prior to drawing no. 2. The drawing itself was lost, but Saarinen's comments are available:

[S-]SKETCH #3

The museum was placed underground, taking advantage of the difference in level between Third Street and the top of the levee in order to concentrate life near the river.

Criticism: The village of historical buildings seemed functionally out of place at the entrance to the living memorial [United Nations] and seemed to cut up the forest too much. The higher mass of the living memorial seemed to be too close to the arch. The entrance to the museum was awkward. Walking from Third Street, it was necessary to descend stairs and then turn back on one's self to enter the museum.⁶⁹

By enabling the architect to specify the design elements that gave him dissatisfaction, this lost drawing led the architect to come up with the design alternatives that are seen in drawing no. 2. The village is located toward the north side of the forest; the United Nations building consists of three blocks, the highest of which is located at the farthest point south of the site, perpendicular to the river, as is clearly shown in elevation. The stairs approaching the sunken plaza are perpendicular to the procession from

⁶⁹Ibid., sketch #3.

Third Street to the levee, so that the entrance to the museum is not so awkward as in the former design.

Before drawing no. 2, another drawing received the written comments of Saarinen:

[S]-SKETCH #4

Criticism: The north entrance to the memorial plaza [the ground of the arch] is inadequate and undignified.⁷⁰

Again, this drawing had set itself up as an unsatisfactory scheme, and suggested an alternative. The result can be seen in drawing no. 2: the passageway from Washington Avenue passes under Eads Bridge then turns into the wide steps descending to the memorial plaza.

Testing Visual Effect of Submission by Smaller and Simpler Drawing

When drawing no. 2 was produced, all the basic elements composing the design had already been determined, and they were located approximately in the same places they would be in the first-stage submission. For example, the levels had already been considered. As seen before, the museum was placed underground. The area of the trees was higher than the ground of the arch, and there were several sunken areas and steps to relate the two levels. The linear strip of gardens between the trees and the ground of the arch had been created. As will be discussed, the major change that would take place between this drawing and the first-stage submission was the design of the garden area, including the museum

⁷⁰Ibid., sketch #4.

entrance. Only minor changes in the design elements were contemplated in this drawing.

The more important role that this drawing took was in the evaluation of the visual effect of the submission drawing. There was a need to envision the submission drawing before setting to work on the actual sheet. This type of drawing helped the architect to visualize the final drawing without actually going through the production of the final.

The way this drawing was produced corresponded to the purpose. While striving for economy of time and effort, the architect drew in a manner and extent that allowed him to easily imagine the result of the submission drawing. Several aspects of this drawing reveal these characteristics.

First of all, this drawing was produced to examine the organization of the submission sheet. The program specifically asked for a plan, an elevation, and cross sections. Drawing no. 2 conformed to this specification, except that the sheet lacked cross sections. The cross sections they had in mind were quite small, and therefore could be fitted in later, whereas the plan and the elevation took up almost the entire width of the sheet and had to be arranged carefully. Moreover, the cross sections were least important for describing the design among the three kinds of drawings. Whereas the plan and the elevation were necessary to depict the design, the cross sections could easily be imagined once the other two were shown. Based on the difference in importance, the team drew the plan and elevation in drawing no. 2, while saving time and effort by not drawing cross sections. On the

other hand, they took care to arrange the sheet with the plan at the top and the elevation at the bottom so that each corresponded to the other.

An explanation of the design, in Eero's own handwriting, was attempted at the top left corner but not completed. It too shows an intent to expend the minimum effort necessary to achieve the effect. By starting with real sentences and trailing off into strokes that merely looked like letters toward the end, Saarinen achieved his purpose of examining the visual effect of this particular arrangement of the explanation on the sheet, while deferring the task of coming up with a complete text.

In submission sheet A, the two cross sections were placed at the top of the sheet, and the description was moved from the top left corner of the sheet to the space between the plan and elevation. One of the changes in arrangement between this drawing and the submission sheet A was the space between the plan and elevation. This space was necessary since it represented the river in plan and the sky in elevation, and yet without the description, it would have left too large an area bare of drawing on the sheet (fig. 24).

The rendering techniques were also tested with the submission in mind: The roof plans of the buildings are shown in white and the shadows in black; the pavements have patterns; and the arch and its shadow have gradation of tones. All of these depictions were similar in manner to the submission sheet, and yet simpler. In particular, the roof plans were depicted as horizontal planes on top of the building masses in this drawing, whereas in the submission sheet, smaller penthouses were added to break

up the planes. The patterns on the pavement were rough and bigger in this drawing than the one that appeared on the submission sheet later.

Lastly, the drawing was made at a small scale, probably half that required by the program, as Saarinen's comments on S-sketch #1 suggested, and enlarged to the required size by photographic reproduction. It was drawn with pencil, whereas the submission drawing was drawn in ink. Drawing in a smaller scale and with pencil undoubtedly saved time and effort and allowed for quick review. This again corresponded to the architect's objective of examining in drawing no. 2 the visual effects he planned for the submission drawing while not actually completing them and thereby maintaining economy of drawing.

In the elevation, there were a number of minor differences from the submission drawing. The high-rise buildings in the background were shown in several layers with single outline, and the reflection of the arch in the water was drawn. The light and shade on the arch were opposite from that found in the submission, with the top shiny and the bottom darker. When they compared the ten schemes, the team must have also compared the drawing techniques and methods of expression. After comparing the effect of light and shadow between this drawing and another in which the arch was depicted with the top darker and the bottom lighter, the team preferred the latter effect.

Sculpture Courts:

Rough Drawing Representing Specific Design Issues

This next free-hand drawing (drawing no. 3, fig. 83) introduced the idea of locating the sculpture courts linearly at the edge of the memorial plaza beneath the overhanging platform that jutted out from the park. The level difference between the memorial plaza and the tree-shaded park was utilized, as seen in a perspective sketch on the first-stage submission drawing. The upper level of the park and the memorial plaza were connected by steps located in the central and largest garden. In the first-stage submission this area was explained as following:

The sculpture and small courts should afford many opportunities for design integration in the whole space. They also make an intimate relation between people and art as they stroll or sit beneath the projecting roof of the arcade.⁷¹

The sculpture courts were an important design element for Saarinen, for his arch was primarily to commemorate Jefferson, and yet the program also included five additional elements as monument:

The monument or monuments ... must be adorned with, or accompanied by, sculptural works illustrating or symbolizing any or all of the following seven episodes or activities.

- a) The signing of the Louisiana Purchase Treaty in Paris.
- b) The transfer of the Louisiana Territory to the United States at New Orleans.
- c) The transfer of the Upper Louisiana Territory to the United States in front of the Spanish Government House in Old St. Louis.
- d) The outfitting of the Lewis and Clark Expedition in Old St. Louis.

⁷¹First stage, sheet A.

- e) Trapping and fur trading.
- f) The pioneer movement which flowed through Old St. Louis by land and water.
- g) Life and traffic on the Mississippi.⁷²

Drawing no. 3 may seem to be out of chronological order, for it is more abstract than drawings nos. 1 and 2. It is freehand and not to scale, whereas nos. 1 and 2 are drawn with a straight edge and to scale. If one were to assume that the precision of drawing corresponded with the level of design development, then an abstract drawing would seem to precede hard-line drawings. Under those assumptions, one might conclude that drawing no. 3 was produced much earlier than drawings nos. 1 and 2. However, there are some definite reasons why this drawing in the style of a rough sketch may be presumed to have been done after drawing no. 2, although neither drawing bears a date.

First, drawings nos. 1 and 2 do not contain this idea of a linear sunken garden at the edge of the treed area. In drawing no. 1, the trees extended right to the edge of the memorial plaza, or the ground of the arch. In drawing no. 2, the sculpture garden, with rounded corners, was located on the upper level. If the sunken garden had been introduced, before drawings no. 1 or 2, rather than after them, then these drawings would have shown the sunken garden. Although roughly drawn, the design is more developed here than in drawings nos. 1 and 2.

This observation corresponds to what Saarinen wrote on drawing no. 3.

⁷²Program, p. 15.

I haven't really had a chance to draw this up carefully but I think it has some real possibilities. It would eliminate any feeling that the lower area is to[o] arid—it would give us a chance to put trees further out—it would give us a chance to place sculpture in a human way and so that people have the patience to look at it.—This has one disadvantage—it does take room but I think we can adjust the whole thing so that the forest part doesn't get to[o] thin.⁷³

The writing confirms that he was thinking about the richer treatment of the lower level, using the space at the edge between the two levels as the sculpture courts.

In addition, a comparison between this drawing and the ones before shows that the entrance to the museum is now closer to the memorial plaza. As a result, it became possible to extend the mall farther out toward the river, as Saarinen commented in the writing quoted above.

The second reason to assume that this sketch was done after drawing no. 2 is that the shapes of the three areas bare of trees on drawing no. 3 were so similar to the ones in drawing no. 2 and distinctive even in rough sketch, and this suggests that the shapes were already studied elsewhere and this rough sketch was a copy, either by overlay or by visual observation, of the former. Although the technique is rough, the forms of these openings are so specific that they suggest specific drawings prior to this sketch.

The third reason derives from the question of why Saarinen did not use a straight edge or spend more time drawing this scheme. Saarinen went on a vacation during the summer of 1947. Away from the office, he may not have had a drawing board or straight edge at the time he had the idea. The

⁷³"Competition, Jefferson National Expansion Memorial," in Progressive Architecture (May 1948), p. 56.

drawing might well have been created spontaneously as the idea came, whether Saarinen was on a train or in a vacation house at the time. The first comment Saarinen made in his writing quoted above confirms that he only had time to draw it hastily.

Although done in a rough manner, this drawing (no. 3) depicted a particular design, whose specifics had been set in drawing no. 2. The roughness of drawing does not have ambiguity of design as its counterpart. In spite of the drawing's vagueness, the design could be communicated as Saarinen intended because the design had already been understood by his office staff, to whom this drawing was addressed.

Here is a perfect example to answer a question raised in the first chapter, about whether a fragmentary drawing represents a fragmentary idea. Abstractness of drawing does not necessarily mean that an ambiguous design lies behind it. On the contrary, in this case, Saarinen was indicating a specific design by a rough sketch. Saarinen and Barr, having worked on the design together, had, to use Peirce's term, ground in common, which enabled the rough to represent the specific.

Introducing Curved Walls and the South Entrance

Between August 6 and 8, 1947, sometime after drawing no. 2 and before the team started working on the submission drawings, Eero Saarinen and his family were at the office of Dan Kiley in Francona, New Hampshire. They stopped here on their way to a vacation in Maine in order to familiarize Kiley with the design that Saarinen had been working on, and have him start designing the garden.

A letter written from New Hampshire by Saarinen to J. Henderson Barr, who stayed in the office in Bloomfield Hills, contained two sketches (drawings nos. 4 and 5, figs. 84-86).

Dear Jay:

I am sending under separate cover a sketch which I worked out here on the row of commercial buildings west of the thru highway. (All this is on the competition[.]) I hope you like it better—I think what it has accomplished is 1. smaller scale, 2. more broken up and therefore the UN building will stand out more 3. they (I think) look like buildings that could have a lot of charm etc[.] etc.—As they [were] earlier the[y] looked like little impersonal building blocks. Possibly they are too broken up but we can always denude them later.

You all thought I went on a vacation—actually I have been working on the competition until 2 a.m. every night (last three)[.] I have been working with Dan Kiley getting him familiar with the whole thing so that when he comes out to work the (18th or 19th [of August, 1947]) no time will be lost with getting him familiar etc. he [sic.] will bring with him studies on the garden above the museum. Probably also in larger scale. If Veli has finished the enlargement of the plan it might be good if you had a print made and sent it to him air mail[.] that[sic.] would be worth while only if it is done immediately (that is if the plan is in a shape to be printed) otherwise I would let it go.

I have one thought which might be worth while on the general shape of the back wall of the museum. It might have a slight [crossed out] as I have drawn it in the past all the lines have [have] been straight (with the T square) but if this wall paralleled the highway it might look a little better.

See what I mean—

Another thought I had through discussing the a [crossed out]

Showing the project to Dan and others people are concerned—How do you get to the Place from the parking etc?

To strengthen us on this point I have shown foot bridges across in a few places[.] Also lining a minor drive

coming in from the South might be advisable.

Now my only other concern is the rendering—I will write you about that from our next stop as we are leaving now for Maine[.]

So long—Give our love to everybody and don't work to [sic.] hard (but the next thing to it.)]

Eero⁷⁴

The drawing mentioned here that Saarinen had sent under separate cover is not available. However the change that he made to the row of office buildings can be assumed by observing the difference between drawing no. 2 and the submission drawing (drawing no. 7, fig. 88). Whereas in drawing no. 2 the rectangular roof blocks are plain white, in the submission, they are broken up by detailed designs of the difference of levels, creating an interesting pattern of shadows.

The change in design of the garden located on the upper level near the memorial plaza from drawings nos. 2 to 6 (fig. 87) shows clearly that the design had been worked on between the two drawings. In drawing no. 2 the gardens are depicted only as a uniform area, distinguished from the surrounding area by the difference in patterns. In drawing no. 6 each block of garden is broken up by the organic form of passages that wind through, narrowing and widening as they go. In addition, the grounds of the United Nations buildings are treated with decisive designs, including the driveway from the city side, and the reflecting pool and geometrical garden on the riverside. Dan Kiley must have worked on the design and brought it to the Saarinen office later that month, as anticipated in this letter.

⁷⁴Letter from Saarinen to J. Henderson Barr, undated, KR. As for determining the date of this letter, a letter from Saarinen to Kiley on June 24, 1947 and a letter from Kiley to Saarinen on June 26, 1947 were referred to, KR.

The enlargement mentioned in the letter is most probably drawing no. 2, for this drawing is the only sketch that was kept as an enlarged photographic reproduction.

Following the suggestions in this letter, the south entrance to the memorial plaza was created as specified in the submission drawing. The idea of curved walls did not survive in drawing no. 6. However, in the second stage, this idea was taken up once again. The museum building was set at a slight angle to the city street pattern, creating a curving effect.

Detail Designs through Drawing

In drawing no. 6 (fig. 87), a line drawing of the site plan, all the outlines were drawn in this sheet, including the outlines of buildings, trees, and pavements, and the location and size of shadows of the buildings were set in outline. The scale of this drawing is the same as that of the submission. The architects, having already tried out the visual effects of tonal gradation in drawing no. 2 (fig. 82), did not venture to elaborate beyond outlines.

Although it was done immediately before the production of the submission, traces of pencil on the sheet suggest that some major elements of the design were still being studied in this drawing.

The arch was one of these. Two plans for the arch were drawn on this sheet at the same location, the center of the spans slightly north of the axis line of the Old Courthouse. One scheme shows a wider span and the other a narrower one. The span was examined by outline drawing. After the wider one was selected its shadow was drawn on the plan.

The plan shape and the location of the north restaurant, another minor requirement, were also examined on this sheet: First, it was drawn in the same shape and the location as in the previous design; the second scheme has the same shape as in the previous design but the location of the restaurant has changed to where it is in the submission; and finally, the shape took on the form found in the submission. After the plan shape and the location of the restaurant were determined, the shadow was constructed.

These two instances are examples of studies of a specific element in drawing. Here once again, economy of drawing is maintained by depicting the design with the minimum detail required for examination. For the architect to study the size of the arch or the shape of the restaurant, it was sufficient to draw several alternatives in outline. Outline drawings depict the size and the shape precisely and sufficiently for examination. The shadow drawing, however, was not necessary for this study. If the architect had cast a shadow in all the alternatives being examined, it would have been waste of time and effort, and moreover it might have obscured the attention from what should really be examined.

The architects placed this plan underneath the sheet of the submission drawing for tracing. Unlike the previous study drawings, the scale of this drawing is the same as the one submitted in the competition. The trees were drawn in outline only, for the team had already tested the rendering technique of cross hatches on the previous drawing. Instead, the team was concerned with the placement of the trees on this sheet. Vertical lines were drawn from the other side of the paper in pencil at intervals (about one half of an inch apart) to work as guidelines to determine the

location of the trees. The trees were aligned so that the width of the trees was approximately the same as the distance of these lines. These guidelines were also used for measuring the intervals of the pavements.

Depiction of Trees: Spontaneous Technique

Preserved to Presentation

In contrast to the self-conscious rendering techniques employed in the second stage, to be discussed later, depiction of the trees by cross-hatching appears to have occurred spontaneously and remained in the design throughout the first stage. The technique of cross-hatching is so commonly used as to represent no particular design intention. This corresponds to the lack of focus of design at this time. In other words, the treed area was conceived without particular objectives that were to be set later in the design. Without any such focus in mind of the architect, the technique, once fixed on a sheet of paper also became fixed in the architect's mind. This technique was to remain unquestioned throughout the first stage. This suggests that there are two ways the accidental movement of the hand may contribute to the design. One is, as expected in the examples of Michelangelo in the first chapter, to let the architect consciously confirm what he has unintentionally or unconsciously drawn. The other is, as seen here in the drawing technique, that the accident remains unquestioned and is therefore accepted as it is. I have called the latter "accidental" because it was not a result of thorough examination of numerous drawing techniques, nor did the architect consciously have a specific design concept in mind to depict through such drawing techniques.

In submission sheet A, (drawing no. 7, fig. 88), the areas covered by the trees on the site plan were drawn by cross hatches, a rendering technique already tried in the previous study drawing (figs. 82 and 89).

The overall effect of these hatches is uneven, with close and heavy strokes interspersed with light and sparse ones. Two renderers worked on it, but it is not possible to distinguish their touches. The unevenness occurred because the spacing of the lines was not determined by measuring, but by visual judgment. The hatches were produced by the same method in the earlier study drawings, but their shortcomings did not show up then. The earlier study drawings did not reveal so much unevenness because they were done with a lighter pencil touch. When the uneven effect at last became visible on the submission drawing, they did not have time to redraw it more precisely or with a different expression.

It may be interesting to compare this drawing with the one of Constant Desiré Despradelle analyzed by Werner Oechslin in the first chapter. The hand of the architect, according to Oechslin, acted simultaneously with the mind as it conceived the design, creating an image on the sheet that was as close as it could possibly be to the mind's image. The drawing was therefore almost simultaneous and identical to the conceiving.

In the case at hand, however, the drawing may more properly be called a rendering. Before cross hatching, the area of the trees was outlined on the sheet. There was no need for the architect to contemplate his design while drawing. The fact that the work could be distributed to two people is evidence that an active mind was not particularly necessary for this

drawing. Furthermore, the fact that it is impossible to distinguish either man's work suggests that the renderers suppressed their designing capacities while cross hatching.

This technique was applied because of the need for speed in rendering. The deadline for the first-stage submission gave the team less than a month to complete their work. With the deadline approaching, the architects could not take a leisurely approach to rendering.⁷⁵ During that period, they did not have time to experiment with various drawing techniques to select the best. They had to use whatever first came to them. Without a chance of evaluation, the technique, which was virtually an accident of the hand in origin, stayed with the design until they began to experiment and to re-evaluate their objectives during the four-month-long second stage.

According to Kiley, he and Saarinen worked on drawing the plan at the same time. A speed competition ensued. Left-handed Eero Saarinen started at one side of the sheet, and right-handed Dan Kiley drew the trees from the other end, so that each could work without disturbing the other. They made this boring work into an enjoyable game as they competed to see who was faster at rendering.⁷⁶ The race finished with Saarinen a little over the center line of the sheet, but Kiley succeeded in drawing stones on the levee in addition.⁷⁷

⁷⁵Interview with Kiley, April 24, 1991.

⁷⁶*Ibid.*

⁷⁷*Ibid.*

Later in the second stage, when they had time for considering other techniques and for rendering, the depiction of the trees was done by airbrush, which created a more even effect and made it possible to depict details of the forms of individual trees.

Horizontal Section of the Arch:

Drawing Specifies Issues of Consideration

The drawing of the basement floor plan (drawing no. 8, fig. 90) was done in black ink on mylar in the same scale as the submission plan.⁷⁸ The intention may well have been to attach this sheet to sheet A (drawing no. 7, fig. 88), so as to accompany the submission. The completeness of the drawing and the medium of drawing suggest the high possibility that it was submitted. At any rate, there is no evidence to the contrary. This also accords with the fact that in the second stage, the team produced an overlay of sheet A (drawing no. 15 and 16, fig. 27 and 101), to be discussed later. At that time, the overlay in fact accompanied the required submission.

The reason why the basement plan of the first-stage entry is located in Kevin Roche's office, and not in the association, might be simply that it was returned when all entries were returned. When the association later requested the submission materials be conserved there, Saarinen seems to have returned only the required drawings and retained the basement plan with him. In fact, this was what happened to the overlay of the second stage.

⁷⁸Kevin Roche, JNEM History Tube No. 1. Original ink on mylar drawing and the print on mylar were both kept.

The soil around the basement was depicted by ready-made screentone of hatches. It depicted the parking spaces, the museum, the sculpture garden, and the highways, all of which were situated on the lower level of the park.

This drawing was done after the studies, and at the same time as the submission drawings. The use of ink on a thick transparent sheet, suggests that the team was not exploring the design possibilities at the time.

Although this drawing was not required by the competition program, the architects produced it, as if they were presenting it as a set together with the site plan. This drawing was the only one that depicts the location and entrance of the museum. It was placed behind the sculpture gardens, and the entrance was located at the lower landing of the steps on the central axial line between the arch and the Old Courthouse.

The most important element in this drawing is in the horizontal section of the arch's feet. They are depicted as two rectangles in this drawing. The act and product of drawing forced Saarinen to focus on the specific form of the arch. Other drawings had not raised the issue. The plan in the submission drawing depicted the arch viewed from the sky but did not cut it horizontally. The horizontal section of the arch did not appear in the elevation of the submission drawing either. The only drawing that depicts the horizontal section of the arch among the submission drawings was the perspective drawing, yet the shape of the arch was not at all clear in the perspective.

In comparison, this basement floor plan showed the horizontal section of the feet of the arch distinctly as black rectangles, thereby attracting

visual attention to the shape. If the architects had drawn only the site plan and the elevation, the issue of the section may never have been consciously raised in the competition. Once raised, the issue became important: in the second-stage design, the arch's horizontal section was to become triangular.⁷⁹

This is a case in which the particular type of drawing generated an aspect of the design that was to become an issue. It is reasonable to assume that Saarinen had had the idea that the horizontal section of the arch was rectangular before the basement plan was done. Most probably, the architect had accepted this idea without conscious recognition or thorough examination against other options. It is easy, after all, to imagine a rectangular section. The drawing raised this matter, which had been a non-issue, to the level of a serious question that needed much more consideration.

"Gateway to the West":

Other People's Interpretation Generating Design Concept

"Gateway to the West" is virtually a second name for the arch that stands on the river front of St. Louis. This is such a strong concept that people currently make a primary association of the monument with this name. Drawing no. 8 (fig. 90) is the first among the surviving documents to use the term "gateway." The next time the idea appeared was in the letter to

⁷⁹Carl Milles, sculptor at the Cranbrook Academy was said to have been consulted on this issue, once it had been raised.

the structural engineer.⁸⁰ Then the arch was named "Gateway to the West" in the second-stage submission.

This idea did not exist in the competition program or in any other related documents. Nor did it exist in the architects' minds from the very beginning. A new viewpoint on the design of the arch was offered by friends of the architect who observed the first-stage drawings. Saarinen described in the St. Louis Post Dispatch how the idea came up. Friends who had examined his drawings said the arch suggested to them a gateway to the West. "More and more, it began to dawn on us that the arch was really a gateway, and various friends who stopped to look at what we were doing immediately interpreted it as such. Gradually, we named it the 'Gateway to the West.'"⁸¹ This new interpretation helped the architect to concentrate on the monumental quality of the gateway, leading him to change the proportion of the arch in the second stage.

As this example suggests, other people's interpretation may well help to generate design. In particular, it influenced the direction of the design development. A drawing has the power to be interpreted differently from that originally intended. By accepting it, the architect recognizes a new possibility for design development.

It should be noted that there are two kinds of interpretation different from that originally intended. One, as described in the first chapter, is an interpretation that conflicts with the original; the other, as in the case here, differs but does not conflict with the original.

⁸⁰Saarinen's letter to Fred Severud, the structural engineer, November 4, 1947.

⁸¹Saarinen, "Saarinen Tells How 'Gateway' Was Conceived."

In order to accept the idea of a gateway, the architect did not have to disown some properties of the design as he had conceived it. Instead, the new idea gave the architect a specific theme on which to develop his design. In particular, the gateway idea generated in his friends' minds by viewing the drawing justified further concentration on the monumentality of the arch.

Proportion of Arch

One of the drawings that appears on sheet B of the first-stage submission (drawing no. 9, figs. 25 and 91) depicts the proportion of the arch. The mathematical formula for the proportion was devised by one of Dan Kiley's staff, an engineer who later went to work for the Boeing Company.⁸²

The proportion must have been of deep concern to Saarinen. To take so much time and effort on drawing something not explicitly required suggests the depth of his concern and determination as to what he drew.

Another drawing on the same sheet is an aerial perspective of the city. The original (drawing no. 10, fig. 92) is a line drawing done with technical pen and ink, produced by Kiley. The design was already determined and was not simultaneously generated nor examined during the drawing of the aerial perspective. This made it possible for Kiley, who was not a primary designer of the scheme, to produce this drawing. Again the act of drawing in this case was remote from the act of designing. Very little, if any, design development came out of this drawing.

⁸²Interview with Kiley, April 24, 1991.

CHAPTER IV

SECOND-STAGE DESIGN

Changes after Program Addenda

First-Stage Judgment

The first-stage jury was held from September 23 to 26, 1947, in St. Louis. All seven jury members and the professional adviser gathered in the Old Courthouse. Their objective, as promised in the program, was to select five competitors who were to be eligible to compete in the second stage.¹ On the first day, William W. Wurster was elected chairman of the jury. Charles Nagel, Jr., became the secretary to the jury.

On the afternoon of September 23, the inspection of the submissions began. The entries were identified throughout the first- and second-stage judgment by entry numbers, from 1 to 172. Eero Saarinen's scheme bore no. 144. First, 62 entries were disqualified for obvious inadequacies.² The second day was spent in an individual inspection of the remaining 110 submissions. A ballot was held and, according to Nagel, 65 entries received one to six votes of approbation.³ The two schemes that received six votes

¹Program, p. 7.

²Charles Nagel, Jr., "A Sketch Report of the Jury Proceedings, Jefferson National Expansion Memorial, September 23-26, 1947," JNEM.

³According to Louis LaBeaume's record, 59 entries received one to six votes.

apiece were nos. 140 and 144.⁴ Twenty-four entries that received only one vote were set aside from further consideration, along with those that got no votes, upon the suggestion of the chairman, and with the agreement of the individual jury members who voted for them. As a result, forty-one entries survived for further examination.

On the third day, September 25, the jury restudied and analyzed the forty-one submissions. Free exchange of opinions among the jury members was encouraged. On the first ballot of the day, each jury member selected five outstanding submissions, and fourteen entries received one to four votes. Following a further discussion in detail of the fourteen individual projects, the next ballot picked thirteen schemes with one to five votes apiece.

On the fourth and last day, September 26, a series of five ballots was held. According to LaBeaume's record, Saarinen's scheme received the most votes in the first, and, placed second in the following four ballots.⁵ It was

⁴Louis LaBeaume, record of the first stage jury, untitled. Also refer to footnote 5.

⁵The number of votes in five ballots on September 26.

No.	First Ballot	Second Ballot	Third Ballot	Fourth Ballot	Fifth Ballot
144	5	6	6	6	6
64	4	4	4	4	5
140	4	4	2	1	0
41	4	7	7	7	7
124	4	5	5	6	6
8	4	4	5	5	6
27	3	3	3	3	2
94	3	2	3	3	3
147	2				
87	1				
6	1				

The authors of these eleven entries were subsequently identified as, Eero Saarinen team (no. 144); the team of Breger, Hornbostel and Lewis (no. 64); the team of Smith, Hinchman and Grylls and Minoru Yamasaki (no. 140); Harris Armstrong (no. 41); Gordon

agreed that the five entries that received the highest number of votes, namely nos. 41, 144, 124, 8 and 64, be the winners in the first stage.

Additionally, three were selected as runners-up, to serve should any of the above five fail to meet the qualifications required by the program. Later, the professional adviser confirmed that the five selected were all properly qualified.

Program Addenda

The addenda were written by the professional adviser, George Howe. He first sent a draft of the addenda to the finalists on October 20, 1947. A letter dated October 25 from Saarinen to Dan Kiley mentions the arrival of this draft. The completed addenda were sent on November 3, 1947, and received by Saarinen's office on November 5.⁶ They formed a three-page document which contained requirements for design and drawings. In it, Howe made clear the primacy of the jury in the formulation of the addenda.

Phillips (no. 124); the team of T. Marshall Rainey (no. 8); the team of Pilafian and Montana (no. 27); Percival Goodman (no. 94); the team of Eliel Saarinen and J. Henderson Barr (no. 147); the team of Clinton A. Schofield (no. 87); and the team of Roger Bailey, Marshall Fredenicks, and A. Maestro Valorio (no. 6). The architects of no. 125 were Hugh Stubbins, Jr., and G. Holmes Perkins.

⁶"Second Stage Addenda to the Program," Jefferson National Expansion Memorial Competition, George Howe F.A.I.A. - Professional Adviser, Old Courthouse, 415 Market Street, Saint Louis 2, Missouri, KR. According to the letter of November 3, 1947, from George Howe to five winning teams, which accompanied the addenda, a draft of the Addenda had been sent to the competitors before this addenda. (A letter of October 26, 1947, from Saarinen to Kiley talked about the arrival of the addenda. There is the accompanying letter of October 20, 1947, from Howe to Saarinen.) In the same letter Howe explained that because of the conflict among the parties involved, "the Second Stage requirements have had to be limited to those surface elements which conform to the purposes of the U.S. Commission and of the National Park Service," and "nothing is to be assumed as to the relocation of the railroad tracks, ... and that the underground parking problem and the Living Memorial are left for future consideration."

These requirements [for the second stage] are based on decisions reached after considering the comments of the Jury of Award and the Association, as well as consultation with the National Park Service.⁷

Each juror had written his comments on each of the selected entries after the jury session, probably after departing St. Louis, and submitted them to the professional adviser.⁸ In addition to having access to these written records, Howe had, of course, been present at the jury meetings. Although jurors' comments were not shown directly to the architects during the competition, some of their criticisms which prevailed through the program addenda may have caused the Saarinen team to change their design. This must be traced before we can properly address the effect of drawing on their design.

In addition to the addenda, comments and questions were encouraged. In the letter accompanying the draft of the addenda, Howe wrote to Saarinen:

I am enclosing herewith a draft of the "Second Stage Addenda to the Program" on which I am asking all five participants in the Second Stage to comment. Comments will be sent in anonymously as in the case of questions, and each competitor's comments will be communicated to the four others. I want particularly to know whether the Addenda are quite clear. It would seem desirable to eliminate the need for a question period after Addenda

⁷Addenda.

⁸A letter of October 1, 1947, from Roland A. Wank to George Howe suggests that the comments were written after the jury. "Attached you will find the comments required of the Jury of the five entries that were placed and, in abbreviated fashion, for the first two substitutes. They are written without having the drawings in front of me, and are the best I can do under the circumstances," JNEM. Among these comments, those of Charles Nagel Jr., Louis LaBeaume, Herbert Hare, and Roland Wank are preserved in the Archives. Those of Fiske Kimball, Richard J. Neutra, and William W. Wurster were, however, not available.

are issued. They will be issued on or about November 1, and the schedule will be maintained as set forth in the Program, except that the mailing date of submissions will be postponed to February 10th.⁹

Saarinen submitted two comments and three questions on November 3, and received the answers on November 7, written by the professional adviser on November 5.¹⁰ These answers may have influenced the design changes.

Some specifications in the addenda appear to have been directed to the other entrants in the competition. That Saarinen's entry was not the first choice among the five finalists suggests that the professional adviser's attention was not entirely absorbed by his design. An example of comments not related to the Saarinen scheme is the following:

It is to be noted that the problem here presented consists largely of landscape design and the desirability of associating themselves with landscape architects is again brought to the attention of those architect competitors who have not yet so associated themselves.¹¹

This comment is obviously not addressed to the Saarinen team, which had Dan Kiley as its landscape architect.

⁹Letter from Howe to Saarinen, on October 20, 1947, KR.

¹⁰Eero Saarinen, "Jefferson National Expansion Memorial Competition, Questions and Comments on Second Stage Addenda to the Program," unsigned, dated November 3, 1947. "Jefferson National Expansion Memorial Competition, Answers to Questions Raised by the First Draft of the Addenda to the Program Belatedly Received from a Competitor," dated November 5, received by the office of Saarinen on November 7, KR. The other entrants also submitted the comments and questions, but they have not been found in the archives.

¹¹Addenda, p. 3.

Restriction of Site and Facilities

The addenda compelled the Saarinen team to eliminate some areas from their design site. Unlike the first-stage program, the addenda specified the site to be the "historic" area over which the association had legal control. The site was to be confined north of Poplar Street, south of the Eads Bridge on the continuation of Washington Avenue, east of Third Street, and west of the levee of the Mississippi River. As a result, Saarinen's proposals to place office buildings between Third and Fourth Streets, apartment buildings north of Washington Avenue and to develop recreational facilities on the eastern bank of the river were eliminated.¹²

Some facilities, such as helicopter landings, fixed landing structures for boats, and railroad terminals, which many architects included, following 1944 proposal by Armstrong, had to be eliminated according to the specification of the addenda.

Saarinen had to change the parking locations to conform to the program addenda:

Access for vehicles is to be from the upper (that is the traffic distribution) level of Third Street at grade. Surface parking for a small number of vehicles, at one or more points, is to be provided adjacent to Third Street for the use of visitors desiring to view the Historic Site briefly.¹³

On the first submission, six blocks of parking areas had been located underground, to be accessed from the surface level of Third Street, from the south side, or from the north side (drawing no. 8, fig. 90). In the second-

¹²Ibid.

¹³Ibid., p. 1.

stage scheme (drawing no. 15, fig. 26), however, a parking lot was provided on the surface level on the east side of Third Street, to be accessed from Third and Poplar Streets.

Demise of the United Nations Complex

The addenda also led to a change in the form and purpose of a major building in the scheme. The high-rise building for the United Nations at the south end of the site in the first-stage scheme was replaced in the second stage by a low-rise museum. In the first-stage scheme, the elevation from the river had shown the United Nations building standing almost as tall as the Old Courthouse, while in the second, the museum building was drawn lower than the trees (drawing no. 7 and 15, figs. 24 and 26). In the first stage, the museum had been placed underground (drawing no. 8, fig. 90). In the second stage, the original underground museum was removed.

The replacement of the United Nations building was in accordance with the specification of the addenda. The emphasis of Saarinen's first-stage design seems to have been on the creation of the United Nations building as the living memorial, conforming to the specification of the original program, which clearly stated that the association's primary purpose was to create a "Living Memorial to the vision of Thomas Jefferson in the form of Continuing Activities."¹⁴ However, the addenda specified that "a possible future Living Memorial cannot be made a part of a plan to be recommended to the Department of the Interior for execution and is not be considered in

¹⁴Program, p. 4. The fact that Saarinen and his father, Eliel, had recently entered the competition for the Smithsonian Art Gallery in Washington, D.C., might have made him quite interested in the design of the museum for the Jefferson Memorial.

the design.”¹⁵ Therefore Saarinen had to discard the United Nations building from his design.

Museum

The museum was moved from its original underground site to the location of the United Nations building. This placement was encouraged by the specification of the addenda that the buildings other than the memorial should be located near the boundary of the site:

The Architectural Memorial may be placed anywhere on the Historic Site, at the choice of the Competitor, but other buildings of all kinds should be placed near its boundaries rather than towards the centre.¹⁶

This provision apparently caught Saarinen’s attention; he asked the professional adviser to “explain the reasons behind this decision.” He further asked if it was “because of (a) convenient access to the buildings or (b) not breaking up the continuity of the park.”¹⁷ To this the professional adviser answered,

...the National Park Service, representing the United States as owner of the historic site, has finally determined that it wishes to have the site treated as a park with buildings inconspicuously distributed in it rather than as an architectural composition surrounded by a park.¹⁸

¹⁵Addenda, p. 3.

¹⁶*Ibid.*, p. 2.

¹⁷Saarinen, “Jefferson National Expansion Memorial Competition, Questions and Comments on Second Stage Addenda to the Program,” dated November 3, 1947, unsigned, KR.

¹⁸“Jefferson National Expansion Memorial Competition, Answers to Questions Raised by the First Draft of the Addenda to the Program Belatedly Received from a Competitor” dated November 5, 1947, KR.

This was the first statement that explicitly requested a park with a strong memorial, probably in the central area, with other buildings on the perimeter of the site.

The location change of the museum was probably inspired by the suggestion in the addenda that the construction should be in successive phases.

As suggested in discussing in the Program the nature of the interests involved in the project, it is to be anticipated that it will be developed in successive stages rather than at one time, ...

As suggested in discussing in the Program the nature of the interests involved in the project, it is to be anticipated that it will be developed in successive stages rather than at one time, and Competitors, in preparing their designs, should keep this fact in mind. Only the final development is to be shown in the submissions, however. The design for each successive construction stage, however it may be scheduled, should be conceived as far as possible as complete in itself. In other words, the layout, whether formal or informal, had best be considered as a park, in which buildings may successively be placed with appropriate locations assigned to them, rather than as a balanced composition requiring completion to produce a satisfactory effect. It is deemed undesirable, therefore, that buildings, as distinguished from the Architectural Memorial, be too high or conspicuous.

The museums, as called for in the Program, are to be conceived as being constructed in successive stages rather than as a whole and should be designed accordingly. No detailed requirements for them are available and Competitors may use their own judgment in determining these.¹⁹

¹⁹Addenda, p. 2.

The low-rise building, consisting of a number of masses, located at a distance from the memorial, was more suitable for construction in successive stages than the underground building right below the foundation of the arch. It was clear also in the addenda that the jury preferred a low-rise building for the museum in order to emphasize the memorial.

In addition, the change in the height of the building at the south end of the site, which changed from the United Nations to the museum, was a reflection of the other elements of the designs drawn on the elevations. In the first scheme, the elevation from the river showed, as the background of the park design, the high-rise buildings proposed by the architect between Third and Fourth Streets. As seen in the study drawing (drawing no. 1, fig. 81) made before the first-stage submission, the original intention was to group the United Nations building with these buildings, by keeping its height the same as the others. In the second-stage design, by contrast, the high-rises in the background were taken away. There was then no reason to make the museum a high-rise building. Instead of the high rises that made the background in the first-stage elevation drawing, the rows of trees became a kind of the background in the second stage. The line of the top of the trees was kept horizontal. This type of evaluation was easily studied once the architect drew the elevation from the river.

Architectural Memorial

The addenda also indicated a shift in emphasis of the program requirements. This shift resulted from the jury's review of the first-stage entries. Many jurors were impressed by the monumentality of Saarinen's

arch, and this was signaled to him, albeit indirectly. Charles Nagel, Jr., called it an “imaginative and exciting monumental arch—an abstract form peculiarly happy in its symbolism”²⁰; Louis LaBeaume concluded “the great parabolic arch is impressive in conception and scale, but [I] doubt its ultimate realization”²¹ ; and Wank remarked: “the monument seems to be beautiful and relevant; perhaps inspired would be the right word. I think it would remain so, even though budget limitations would require a reduction in size.”²² Although these comments were not directly communicated to Saarinen, the addenda clearly stressed that the memorial was the most important element of the whole complex. In addition to the comments on the location of the memorial quoted above, the addenda specified the memorial as follows:

The Architectural Memorial ... is to be conceived as a striking element, not only to be seen from a distance in the landscape but also as a notable structure to be remembered and commented on as one of the conspicuous monuments of the country. Its purpose should be to attract the interest of the multitude as well as that of the connoisseur of art. The development of a suitable symbolic form is left to the Competitor. It is to be essentially non-functional, though its interior, if any, may of course be accessible.²³

In comparison, the original competition program merely offered a long description of the historical incidents that the monument was to symbolize.

²⁰“Comments on Individual Projects” by Charles Nagel, Jr., JNEM.

²¹“Notes on Five Premiated Designs, September 26th, 1947,” by LaBeaume, JNEM.

²²Untitled, by Wank, JNEM.

²³Addenda, p. 2.

The monumentality of the form was clearly given more importance in the second stage.²⁴ Saarinen must have realized then that he should be concerned most with the arch, especially its monumentality.

Saarinen's comments on the submission of Hugh Stubbins, Jr., and Holmes Perkins (figs. 49 and 50) suggest that Saarinen was aware that the changed program had made the monument more important than the living memorial or the museum. He wrote to Stubbins:

Thank you very much for the photographs. Your scheme was beautifully worked out and beautifully rendered; but from the indications in the program for the second competition, one can tell that the jury must have felt that it had too great an emphasis on the building.²⁵

This change in the program may well have been the cause of Saarinen's wish to make the arch taller and shorter in span. Saarinen wrote to Fred Severud, his structural engineer from New York, on November 4, one day after he sent out questions and comments on the addenda, expressing his desire to make the arch higher. However, the development of that particular change in the form involves drawing. It will be discussed later.

Restaurants

The second-stage addenda requested a slight change in the locations of restaurants:

Restaurant facilities, whose extent the Competitor may determine, of a popular rather than a luxury type, are to

²⁴Program, p. 15.

²⁵A letter of November 25, 1947, from Saarinen to Hugh Stubbins, Jr., KR.

be provided at either extremity of the Levee or at both extremities. They may be placed either on the Site or on the Levee itself.²⁶

One of Saarinen's restaurants, on the north side of the site, as was shown in the plan as well as perspective drawing, used to be elevated from the levee over the river. Another site of the restaurants was the south end of the levee. The north restaurant had to be brought into the levee or further inside the site, to follow the addenda.

The Mall

The idea of an elevated walkway above Third Street, to connect the Old Courthouse and the competition site, was dropped in the second stage. The addenda said, "The block between Third and Fourth and Market and Chestnut Streets, facing the east elevation of the Old Courthouse, is to be left free of structures other than landscaping elements."²⁷ In the first-stage entry, an elevated walkway crossed Third Street and continued eastward as the mall to the slab overhanging the sculpture courts. The mall consisted of a series of wide steps with long landings between them. This treatment was meant to ease the considerable level difference between the ground of the Old Courthouse and the east end of the competition site. In the second-stage submission, pedestrians were expected to cross Third Street at ground level. The three levels of the Old Courthouse, Third Street, and the east edge of the site were connected by gradual slopes.

²⁶ Addenda, p. 2.

²⁷ Ibid., p. 3.

Old Rock House

The Old Rock House, a small building on the riverside, was later to play a significant role when Saarinen used drawing to develop his design of the arch. Saarinen had intended to demolish the building, which would have sat under the arch, but its preservation was required by the addenda:²⁸ "The Old Rock House is to remain in its present location and at its present level."²⁹ This was a change in the program, for the preservation of the Old Rock House had only been recommended in the original program. Saarinen seems to have had the idea of demolishing the Old Rock House in the first scheme, for no rendering of this building exists in the first submission.

Drawing Requirements

The addenda required two sheets of drawings. Sheet A was to include a plan, east elevation, and cross-section at a scale of 1"=100"; sheet B was to be a perspective drawing. The deadline was extended by seven days. Drawings were to be shipped no later than February 10, 1948.³⁰

²⁸The Old Rock House was demolished after all during the construction stage.

²⁹Addenda, p. 1.

³⁰Program, p. 3.

Design through Drawing

Location of Arch:

Elevation Generating the Change

The first available drawing during the second-stage of the competition (drawing no. 11, fig. 93) was produced after Saarinen received the second-stage addenda. The precise date is unknown. But the architect already knew the jurors' instructions from either the draft of the addenda, which was received on October 20, 1947, or the final form, which arrived on November 5: Several design changes were already made accordingly. The United Nations' building had already been replaced by the low-rise museum; the plan of the building bore a letter "A," which Saarinen used to indicate the museum building for Progressive Architecture; the area between Third and Fourth Street, south of Poplar Street and north of Washington Avenue had become bare of buildings; the helicopter landing pad and fixed boat terminal were eliminated; the connection between the site and the Old Courthouse was brought down to the ground level; and the Old Rock House was drawn on this plan.

Among the changes on drawing no. 11 which were not directly caused by the program addenda was the location of the arch. Here the idea of aligning the center of the arch exactly with the Old Courthouse emerged. This drawing lined up the two structures on a single axis.

The addenda did not suggest the relocation, although one juror, S. Herbert Hare, mentioned this matter:

There is considerable question in my mind whether the arch suggested is practical. If used, I think it should be

centered on the vista, and the vista should be much more wide and open, so as to get an adequate view of the arch.³¹

However, these comments were not made known to the competitors in the second-stage addenda. Indeed, the change made by the Saarinen team did not correspond to Hare's comments, for the arch was moved not to the center of the vista but further south at the end of the second stage. The change of the axis was suggested through the act of drawing, particularly, first drawing a plan and then an elevation.

Several stages of change, including this one, took place between the first- and second-stage submissions. During the preparation for the first-stage design, after the arch and the Old Courthouse were made to correspond with each other (as seen in drawing no. 2, fig. 82), the architect seemed to have fixed his idea to locate the arch slightly north of the axis of the Old Courthouse. In the second-stage submission, however, the arch was relocated slightly south of the axis of the Old Courthouse. Between these two submissions, at least two different locations were suggested. The dissatisfaction with the previous designs, which arose only by viewing particular types of drawings, prompted the architect to make these changes.

After studying the addenda, Saarinen must have drawn the Old Rock House onto his first-stage design. Until receiving the addenda, Saarinen evidently had intended to demolish that small structure near the levee; for, as noted before, the drawings produced during the first stage did not show it. When he drew it in, it created an awkward effect; the center and highest part of the arch was almost exactly over the Old Rock House. This can be easily

³¹"Comments of S. Herbert Hare on Designs selected by the Jury for the Jefferson National Expansion Memorial Association Competition," JNEM.

visualized by superimposing the plan of the Old Rock House on the submission drawing. The resulting dissatisfaction must have led the architect to conceive another design that might solve this problem.³²

The result was this drawing (no. 11, fig. 93). In this plan, instead of aligning the arch with the Old Rock House, the architect placed the arch and the Old Courthouse on a single axis. In this plan, there seems to be no apparent problem. The symmetry along the single axis of the Old Courthouse and the arch was broken up successfully by minor elements drawn on the plan; the shadow was cast with the sun from the southwest, creating the asymmetrical effect of the shadow of the arch on the levee and the water. The gap in the trees along the axis line was treated differently on the south and north edges, the south edge being straighter and better defined, and the other being more ragged and bevelled. The block between Third and Fourth Streets on the axis was also differentiated north and south by asymmetrical rows of trees. With only this plan to examine, the location of the arch appears to work well.

However, when the architect drew the elevation that corresponded to drawing no. 11, the unsatisfactory visual effect of this design became apparent. Only in the elevation could the vertical relationship between the arch, the Old Rock House, and the Old Courthouse be envisioned. Although not available, the elevation undoubtedly showed clearly and precisely that the arch was still too high in relation to the Old Rock House right below it. The elevation also showed the static visual relationship between the Old Courthouse and the arch, which Saarinen had successfully

³²Letter from J. Henderson Barr to author.

avoided during the first-stage design. The plan could not show these problems clearly. In elevation, however, they could not be left unrevealed.

As a result, the architect came up with a different idea: to locate the arch further south of the axis of the Old Courthouse, so that the Old Rock House is much closer to one of the foot of the arch, about a quarter of the span of the arch. Only with this relocation were the right relationships between the arch and the Old Rock House, and the arch and the Old Courthouse established, without destroying the basic tie between the Old Courthouse and the arch.³³

This is another example in which a particular type of drawing obscured some aspects of the design, while another type revealed those aspects. The plan, with its asymmetrical shadows and tree arrangements, obscured the relationship of the three structures, whereas the elevation must have revealed it. Without drawing the elevation, the relationship of the three structures in the design depicted in drawing no. 11 would have probably been left unquestioned. Only by drawing the elevation did visual dissatisfaction lead the architect to recognize the problem in his design.

Lucid Arrangement of Plan

In contrast to the first-stage entry, all the elements of the second-stage plan (drawing no. 11, fig. 93) became lucid. Certain changes must have been thought of by the architects in observing and examining the first-stage plan. For instance, the trees were arranged asymmetrically, and the museum

³³In the construction stage, the location of the arch was moved back to align its central axis with that of the Old Courthouse. Statement by Eero Saarinen, October 2, 1957, JNEM.

building was placed at a slight angle to the city blocks. And there had been no comment from the jury that could suggest this change.

The plan on the first-stage submission sheet A (drawing no. 7, fig. 24) gives an impression of its rigid arrangement. The high-rise buildings and the sculpture garden were arranged at right angles, parallel to the city blocks. The trees were arranged along the same directions, using guidelines drawn vertically on another sheet. The only curves on the plan were in the street that led to Eads Bridge, the Third Street Highway, and the outlines of the memorial plaza.

Saarinen's concern with the stiffness of the design was apparent in the comments he made on one of the drawings he sent to Progressive Architecture, which now is lost: "[S-]SKETCH #6 Criticism: Too stiff and architectural looking and does not convey the free flow of a park. ..." ³⁴

At the end of November, Saarinen and Kiley were still concerned with the stiffness of the plan. Saarinen wrote to the landscape architect:

I have just returned from New York-Philadelphia-New York. Saw Lou Kahn's scheme and Ed Stone's. Since Ed Stone worked with Noguchi and my informants tell me that Harris Armstrong, working with Noguchi, is in the finals, I think I learned much. I have a few ideas on the design and rendering of the plan which I think are important:
 (a) I agree that we should get more away from the stiffness and formality of the plan. ... ³⁵

³⁴Saarinen, "Comments on Early Sketches," p. 2, KR.

³⁵Letter of Saarinen to Kiley, dated November 25, 1947, KR.

Saarinén apparently tried to loosen the arrangement through many sketches he produced, as he explained in his comments on two of the preparatory drawings for no. 9: “[S-]SKETCH #7 & #8 A striving toward informality with freely flowing hills and valleys....”³⁶

Although the improvement was clear, Saarinen was still dissatisfied with the sketch, drawing no. 11:

[S-]SKETCH #9

All the main elements are in their final location.

Criticism: Neither the pedestrian circulation nor the museum plan seemed to look logical. There is a certain stiffness in the shapes on the southern part of the plan. There is also a certain tension in the northern part of the plan. The two ends of the memorial plaza are too similar in treatment.³⁷

S-Sketch #9 is not identified, but I take it to be drawing no. 11, which displays the characteristics Saarinen complained of. Drawing no. 11 is problematic in that the south and north ends of the memorial plaza, including the access patterns, are treated in the same manner. The memorial plaza looked like a long oval, and the circumferential drives were outlined by rows of trees, and the access points of these drives to the memorial plaza both had rotaries with some kind of circular gardens in the middle.

In addition, some unsatisfactory elements that had become apparent in reviewing S-sketches #7 and 8 had not been solved:

The circumferential drive was too undefined in use and was taking too much good park space away. The shapes of

³⁶“Comments on Early Sketches,” sketch #7 & #8.

³⁷*Ibid.*, p. 2.

forest and ground were ugly. As an abstract pattern, the composition was not stable, and there were too many tensions away from the levee. The memorial plaza was no longer a part of the levee and the river.³⁸

These particular unsatisfactory elements led the architect to produce drawings that focused on specific design issues, before he finally arrived at drawing no. 12 (fig. 94).

The hardest part of the design was the stage just before and just after [S-]Sketch #9. It was here where we made at least 50 careful studies before we arrived at the final solution.³⁹

The Proportions of the Arch

One of the persistent problems for Saarinen was the proportion of the arch, a matter related to its location. In the first stage, the arch was a parabola, and the architect specified the form by giving an equation on the top right hand corner of the submission drawing B. Between the first and second stages, Eero Saarinen expressed his desire to change the form of the arch, making it taller and narrower in span.

As discussed earlier, the addenda, in specifying that the architectural monument was to be the most important element, was the initial cause of the architect's desire for the change. Saarinen then worked toward its particular form relying heavily on the act of drawing for guidance.

³⁸Ibid., sketch #7 & #8.

³⁹Ibid., p. 2. (Kevin Roche)

Saarinen mentioned the change of proportions in a letter of November 4, 1947, to Fred Severud, the structural engineer.⁴⁰ He asked the engineer to consider the structure and construction of the arch and expressed his desire to develop "a somewhat more vertical arch."

We are sending, under separate cover, the photographs of our entry to the First Stage of the Competition. The great arch standing on the western bank of the Mississippi is to symbolize the gateway to the West, the national expansion, and whatnot, which is all more or less to be symbolized as part of the Jefferson National Expansion Memorial.

The arch as shown on the photographs was thought of as a stainless steel arch about 700 ft. wide. For the Second Stage of the Competition, we want to develop the arch further. This development might take the form of a somewhat more vertical arch (perhaps 20% shorter span and a little higher). It might be concrete, or it might be developed as a stainless steel box beam with an outer layer of stainless steel, or whatever is the material that actually and symbolically is the most permanent.

The Second Stage of the Competition should indicate the manner of construction and the process of building this arch, as well as some indications on the footings (rock 20 ft. below surface). I am telling you all this, as well as sending the photographs, so that you have an opportunity to think about this most unusual problem before I come to New York, which probably will be in ten days or two weeks.⁴¹

A comparison of drawings nos. 11 and 12 indicates this change of span in the arch. Whereas drawing no. 11 still keeps a span as wide as in the first submission, drawing no. 12 shows a considerably narrower span. Between these two drawings, the architects must have tried several proportions on

⁴⁰Letter from Saarinen to Severud dated November 4, 1947, KR.

⁴¹Ibid.

different sheets of paper, drawing the arch only in elevation. No intermediate drawing between nos. 11 and 12 has been found, but a set of drawings, produced after the competition, shows how Saarinen used drawing to work out the proportion.

This surviving set consists of four sheets in the office of Kevin Roche and John Dinkeloo, which show how Saarinen studied the proportions of the arch in the period after the competition (figs. 95-98). It can be assumed that these were drawn after the competition because the height of the arch is now 630 feet, as indicated on one drawing. This height was established only after the competition. (In the second-stage submission, the arch was 590 feet high.) The architect used sheets of a manageable size, and drew only the arch, without any surrounding design elements. Isolating a single element on a smaller sheet of paper helps the architect to focus in an economical manner on a particular issue that he has to examine.

The horizontal section of the arch, discussed earlier, came up as a design issue unintentionally. The issue arose as a side product of a drawing that the architect produced with a different purpose in mind. The four sheets examined here also helped the architect focus his attention on one particular design issue among many. A difference exists between these four sheets and the basement plan, however. On the one hand, the focus on the horizontal section of the arch was the accidental result of a drawing created with a different intention. On the other, these four drawings were created to explore an issue already in the mind of the architect. Only the result of the study was unknown at the time.

In his post-competition work, Saarinen referred to the studies of human proportion by Le Corbusier and Vitruvius and drew a number of arches with different proportions. It is probable that he employed a similar method of study during the competition.

When the span was shortened, the arch ceased to be a parabola derived from an equation; it was instead a form that created the most desirable visual effect—that of aspiration.⁴² After the architect arrived at the final form of the arch, the team set forth to prepare the submission sheet in the line drawings.

Line Drawings of Plan

The next three drawings in the sequence are line drawings of the site plan, produced shortly before the final submission drawing. In the first of these, drawing no. 12 (fig. 94), all the structures and circulation, including driveways and pedestrian passages, were in almost the same locations and of the same shapes as in the final scheme. The only difference from the final design was in the museum, which will be discussed later. All the elements had been determined with such finality that later drawings were made by tracing this sheet. Hard pencil and straight edge were used to create precise and sharp lines to define the outlines of the buildings, pavement patterns, and contour lines.

The exactitude of drawing reflected the architect's certainty that he had resolved specific issues brought up in viewing the earlier drawings. To

⁴²Although it was not specified in the submission drawing, the form was recognized as catenary arch.

break up the earlier plan's symmetry he created distinct places in the tree-shaded areas, which he named "the meadow," "cathedral square," and "frontier village." The meadow was a gentle concave area created between the museum and the memorial plaza; the cathedral square was "formed by the Cathedral of Saint Louis of France, the parish house, and the sacristy and historic buildings of the period"; and the frontier village, with its houses, stockades, wells, wagons, and other articles of the early frontier life, was to be the area in the north side of the park.⁴³ The two ends of the memorial plaza were differentiated by inserting three sequences of steps in the walkway between the museum and the memorial plaza. The driveway, whose long and circuitous form had displeased the architect, was cut short so that it terminated in front of the museum. The northern restaurant, which had been circular, became long and thin to relate to the north-south line of the river and the levee. The southern restaurant was eliminated, for, being perpendicular to the flow of the river, it had created, in Saarinen's view, a stiffness in this area of the plan. Instead, a viewing terrace was created between the museum building and the steps leading to the memorial plaza. In effect, the relationship between the museum and the arch was strengthened. The Old Rock House became an important part of the design, for the architect created a sunken area around this small structure and used it to integrate the memorial plaza and the levee, whose relationship had been criticized before.

⁴³Drawing no. 16 (fig. 101).

Location of Trees

The trees in drawing no. 12 (fig. 94) were set in nearly the same place as in the final submission. The improvement of the design is apparent by comparison. In the first-stage entry sheet A (fig. 24), the trees had been evenly arranged, except in the areas of the United Nations, the memorial plaza (the ground of the arch), the mall, and the garden. Even in drawing no. 11 (fig. 93), the trees were treated either as rows to define the driveways or as monotonous areas. The two major areas bare of trees were the mall and the area connecting the museum and the memorial plaza. The trees were now integrated with the distinctive small areas that had been created, namely, the museum, the parking area and southern driveway, the meadow, the cathedral square, the mall, the memorial plaza, the frontier village, and the northern driveway (drawing no. 12, fig. 94). The only tree element of the final design that was still lacking was the grove behind the cathedral near Third Street, where the trees were planted finally in a grid pattern. As Saarinen later explained, in the evolving arrangement of the trees, "The formal elements of the plaza and the axial, tree-lined mall leading to the Courthouse are contrasted with the romantic forest areas on each side of the axis."⁴⁴

This change of design was partly because of the addenda, and partly the initiative of the architect and the landscape architect. The specific passage of the addenda concerning the trees required that "In general, the

⁴⁴Statement by Saarinen, October 2, 1957, JNEM.

Historic Site is to be treated as a tree-shaded park, sloping or terraced down to the river, leaving a clear view from the Old Courthouse to the Levee."⁴⁵ The jury members did not like the dense greenery of Saarinen's first-stage design. Charles Nagel, Jr., commented on Saarinen's first entry, "Perhaps too heavily wooded for use or successful maintenance."⁴⁶ Louis LaBeaume was basically of the same opinion and wrote, "Question, also, the narrowness of the Mall between the Courthouse and Third Street. Feel the main area is overplanted and may look more impressive in plan than it will in reality."⁴⁷ Herbert Hare also wrote "I would like to see more open spaces framed by trees, rather than solid masses of trees. ...the vista should be much more wide and open, so as to get an adequate view of the arch."⁴⁸

Unlike the jurors, Saarinen and Kiley had been pleased with the treatment of the trees of their first-stage design. They were so enthusiastic about the idea of a dense forest that at one point they wondered if they should eliminate the arch and just emphasize the trees. A park shaded by trees seemed most appropriate to them, for they had heard complaints about the heat in St. Louis in the summer.⁴⁹

Before the addenda arrived there was some correspondence between Saarinen and Kiley which suggests that they would not have made this

⁴⁵Addenda, p. 2.

⁴⁶"Comments on Individual Projects," by Nagel.

⁴⁷"Notes on five premiated designs, September 26th, 1947," by LaBeaume.

⁴⁸"Comments of S. Herbert Hare on Designs Selected by the Jury for the Jefferson National Expansion Memorial Association Competition" by Hare.

⁴⁹Saarinen, "Saarinen Tells How 'Gateway' Was Conceived."

change if the addenda had not specified it.⁵⁰ Kiley, having discussed the designs with the members of The Architects Collaborative (figs. 55 and 56), Hugh Stubbins, Jr. (figs. 49 and 50), and the members of Tech Associates (figs. 59 and 60), wrote to Saarinen.

Dear Eero: Happened to be in Cambridge when a joint party was held between Arch Collaborative, [Carl] Koch and [i]ugh] Stubbins in a common showing of Jefferson solutions. I took the liberty to join in and offered to show ours in order to see the others. I felt that you would have done so and would approve the idea. I felt the Arch Coll. had an exciting approach and idea however I felt that all the solutions although good ideas in parts failed to show an appreciation of the existing conditions and felt just a little more encouraged about our chances, but we shall soon know. [Walter] Gropius was quite impressed by the arch and all the others felt their schemes could stand a lot more trees. All the schemes were very bare looking and I feel [they were] slightly out of scale. I feel ours is a little more in scale.⁵¹

The same meeting was mentioned by Norman C. Fletcher of the Architects Collaborative in a letter to Eero Saarinen between the first and the second stages.

Congratulations on the Jefferson competition. It was pretty hard for [] here to believe at first that you hadn't placed. (Confidentially, Ben Thompson thought you would be thrown out on account of the arch and bet Hugh Stubbins 100 that you wouldn't place!) As you probably heard, we had a private showing before the judgment of Koch's, Stubbins', your scheme + Dan's, and ours at my place. It was quite exciting, and everyone gave a short resume of what they were shooting at. Dan Kiley gave

⁵⁰The arrival of the addenda was mentioned in a letter from Saarinen to Kiley of October 25, 1947, KR.

⁵¹Letter from Kiley to Saarinen, undated, received on September 24, 1947, KR.

quite a nice little speech about trees, trees, trees. ... Good luck on stage 2 (I say this even tho I'll probably never swallow the arch)⁵²

Saarinen and Kiley obviously thought that they had treated the trees in an appropriate way, and the members of Architects Collaborative concurred.

Museum

The design of the museum evolved after the first-stage submission, in which the museum had been underground. The change to a low-rise building located in the southern part of the site was directly caused by the program addenda, as discussed earlier. The first sketch to show the change was described by Saarinen: "[S]-SKETCH #7 & #8 ... The underground museum has been removed from the memorial plaza."⁵³ After the decision to bring the museum above ground and put it where the United Nations building had been in the first-stage submission, the architect and the landscape architect discussed the location of its entrance. Saarinen wrote to Kiley on November 25, 1947: "The placing of the museum is still fluid in my mind. It also might be entered from the square opposite the church."⁵⁴ Kiley replied three days later:

A building group confined to the cathedral [sic.] square has good meaning and might work out well. It would concentrate the entrance at one focal point which, I think,

⁵²Letter from "Fletch[er]" to Saarinen, undated, KR.

⁵³"Comments on Early Sketches," sketch #7 & #8.

⁵⁴Letter of Saarinen to Kiley, dated November 25, 1947, KR.

is important. It would also make the handling of the rest of the park more informal.⁵⁵

This line of thought, as shown in drawing no. 12 (fig. 94), led to the driveway that connected the cathedral square and the museum, making the front of the museum the terminal point of the driveway, relocating the parking lot to the western side of the driveway (compare with drawing no. 11, fig. 93), and setting the knot parterre between the museum complex and the cathedral square.

The museum building came into its final form in drawing no. 13 (fig. 99), the next drawing in sequence. Previously, in drawing no. 12 (fig. 94), the museum had had two faces, one facing the park at large, and the other facing the museum courtyard on the south side of the building. In drawing no. 13, all elements were arranged so that the museum was open only to the north, toward the arch and the rest of the park. This final design of the museum depicted in drawing no. 13 included a roof terrace which overlooked the plaza of the museum at the north side of the building. The roof terrace and the museum plaza were connected by a ramp. This arrangement was certainly the more logical solution, tying the museum strongly with the memorial plaza and the arch.

Drawing no. 14 (fig. 100), the last of the three line drawings in sequence right before the production of the submission sheet, was a tracing copy of no. 13. The difference from drawing no. 13 was that Saarinen added trees in no. 14. He drew trees on the back of this sheet so that he could change their shape without erasing the rest of the design elements at the

⁵⁵Letter of Kiley to Saarinen, dated November 28, 1947, KR.

same time. This meant that the architect was confident that the elements in no. 13 would not change further.

Drawing Techniques for Depicting Trees and Other Elements

In the first stage, the trees had been drawn with cross hatches in prismacolor black pencil, slanted 45 degrees to the direction of the sheet.⁵⁶ This method of depicting trees had sprung up early in preparation for the first submission (drawing no. 1, fig. 81). In the second stage, the forested area was depicted by air brush, with pencil to add darkness to the outline.

As noted, the first-stage cross hatches were not the result of a thorough examination of other alternatives. This drawing technique was probably the first thing that came to the architect's mind. During the first stage and the early part of the second-stage phase of the design, this drawing technique remained unquestioned, most probably because in the limited amount of time available the architect was more concerned with the design itself and less with the drawing.

However, in the middle of the second-stage phase, the architect started to consider technique. Saarinen wrote to Kiley on November 25, 1947, suggesting an elaborate drawing technique, using a sheet of plastic overlaid on the drawing:

The plan might be rendered in the following manner: We would make a wonderful design of contour lines drawn with an engraver's tool. On top of this might be a 1/16"

⁵⁶They used prismacolor pencil, according to the conversation with Kiley, on April 24, 1991.

sheet of plastic cut in the shape of the wood. This sheet of plastic might be smoked or it might have texture of foliage printed on the top surface; or the whole plastic enterprise might be forgotten and air-brushed trees substituted. My point is that we could get a wonderful sculptural quality and quite a modern looking plan with the contour device. ... My program is to be Monday and Tuesday, the 1st and 2nd of November [sic. December] in this year of our Lord, in Des Moines; but after that, I'm free to work sixteen hours a day (eight hours sleep) on the competition. I would say that if coming here the middle of that week is convenient for you, ———and so forth and so on.⁵⁷

Kiley was excited about the idea:

Your ideas on the rendering of the plan sound very exciting. I like the idea of the heavy plastic sheet especially and the modelling of contours I envision of a richness untold. ...
Count me in on the eight hours sleep.
I would rather come out the week of the 8th as I will need another week here to get caught up.⁵⁸

Although drawing no. 14 (fig. 100) is basically a line drawing, new techniques for depicting the different areas were tested on some parts of this drawing. At the upper left-hand corner of the drawing, the treatment of the trees was experimented with. The lower levee is covered by a number of different strokes in pencil.

In the end Saarinen did adopt a new convention for trees in the second-stage submission. Sheet A (drawing no. 15, fig. 26) was accompanied

⁵⁷Letter of Saarinen to Kiley, dated November 25, 1947, KR.

⁵⁸Letter of Kiley to Saarinen, dated November 28, 1947, KR.

by a mylar overlay, on which the contours and written description were supplied (drawing no. 16, fig. 101).⁵⁹

The plan on submission sheet A (fig. 26) was drawn with drafting pen and ink, and airbrush was used for shadows of the buildings and difference of levels on the ground, trees, as well as the shadows of the trees on the ground in different tone. Before the airbrush was applied, the drawing was covered by another sheet, which was then cut by knife to reveal the necessary area. A close examination can detect the distinctive curved lines the knife left.⁶⁰ Pencil touches were added to darken the edges of the trees and their shadows. The shape of the mass of trees was also expressed by the touch of pencil. The shadows of the buildings and level differences were the darkest, the trees were the next darkest, and the shadows of the trees, unpaved ground, and flower beds were the lightest in airbrush tone. By these somewhat more burdensome techniques than those used in the first stage, the architect achieved a depiction closer to the reality of the massive trees and avoided the rigid appearance of the cross hatches of the first stage, which had rather relied on their symbolic content for their meaning.

⁵⁹Kevin Roche, JNEM History Tube No. 1. Kevin Roche John Dinkeloo and Associates have the overlay which accompanied the submission as well as the original, which is drawn with ink on thick tracing paper.
Eads Bridge/Tea Pavilion/Restaurant/Parking 187 Cars/Campfire Theatre/Frontier Village/Showing houses stockades wells wagons and other articles of our early frontier life/Gateway to the West/A stainless steel structure 590 feet high - a funicular entered at the Manuel Lisa Warehouse ascends to the observation corridor at the top./Historic Arcade/Louisiana Purchase/The Pioneer Movement/Life on the Mississippi/Trapping and Fur trading/Lewis and Clark expedition/The Mall/The Grove/Cathedral Square, Formed by the Cathedral of Saint Louis of France - the parish house - the sacristy and historic buildings of the period/Knot Parterre/The Meadow/Architectural/Third Avenue Expressway/The Museum/Terrace/Gardens and cafe above/Historic/Restaurant.

⁶⁰Kiley did the work of cutting the paper to cover the drawing sheet for the airbrush. Conversation with Kiley, on April 24, 1991.

Sequence of Perspective Drawings

One sketch (drawing no. 17, fig. 102) that appeared in the May 1948 issue of Progressive Architecture, depicted the construction method of the arch. After winning, Saarinen sent a number of drawings which the team had produced during the competition stages along with his comments on each drawing for publication. Saarinen was preoccupied by the competition design wherever he went, and he drew this sketch while on a train from New York to Bloomfield Hills.⁶¹ He was examining the idea of using one of the presentation boards to show a number of sketches to display several aspects of the arch:

[S-]SKETCH #5

Before receiving the program for the second stage of the competition, which called for one large perspective on the second required sheet, we considered showing, as one of many sketches, a sketch of the "building of the arch".⁶²

Saarinen was planning to present a number of such perspective sketches to explain the effect of the arch. This idea was discarded when the addenda specified only one large perspective drawing on the second sheet.

Sheet B is to show only a perspective of the Historic Site, at as large a scale as possible. It is to be noted that this drawing is to serve not only to allow the Jury of Award to pass on the merits of the design but also to arouse the interest of the public. Every effort should be made, therefore, to make it a striking presentation, showing the character of the proposed architecture and landscaping in a forceful way intended to inform the layman. As larger

⁶¹Letter of Barr to the author, May 9, 1991.

⁶²"Comments on Early Sketches."

scale details showing the character of sculpture and painting proposed by Competitors have already been included in the First Stage submissions only such indications of these elements as may appear in the perspectives are required in the Second Stage.⁶³

Suddenly the architect faced the necessity to come up with a viewpoint and technique that created the best possible effect in a single drawing. Saarinen drew "some ninety small-scale [perspective] sketches" in order to seek out the best possible viewpoint.⁶⁴ Out of seven perspective sketches (named #P-1 to #P-7 by Saarinen) sent to Progressive Architecture, three were published in the May 1948 issue. All three perspectives show the arch with a rectangular section, a detail that confirms Saarinen's claim that "these were started in the early stages of the second phase of the competition."⁶⁵ The change in the cross section of the arch, from a rectangle to a triangle, had not occurred at this time.

One of the three perspective sketches was a view of the arch from under Eads Bridge (drawing no. 18, fig. 103). According to Saarinen, this was drawn with the intention to "emphasize scale of arch and to bring [the] levee into [the] foreground."⁶⁶ But he felt that "the park took too minor a role in this view."

The second perspective sketch (drawing no. 19, fig. 104) was a view from the top of Eads Bridge, "to show more of park and its relation to

⁶³Addenda, p. 3.

⁶⁴"Comments on Early Sketches," Notes on Perspective Rendering, p. 3.

⁶⁵Ibid.

⁶⁶Ibid., SKETCH #P-2.

downtown area.” It depicted part of a building next to the competition site on the edge of the drawing. Saarinen rejected this vantage because the “Levee becomes too much of a major feature.”⁶⁷

To create the best perspective, the Saarinen team also tested a couple of sketches with the setting at night. In one of them (drawing no. 20, fig. 105) the arch was illuminated from the ground. They liked the effect of the light on the arch, but they found the “atmosphere of park is completely lost.”⁶⁸

Saarinen’s comments on the sequence of perspective sketches reveal the questions addressed in reviewing the drawings. The first questions concerned the viewpoint. That is, he wondered how much of the design could be included in the view, which element, if any, was emphasized, and which element became the foreground of the picture frame. The second set of questions had to do with the lighting effect. An unrealistic direction of the sun was not allowed by the architect even if the effect was good for the drawing. The quality of the sun at dusk and of artificial light at night were also considered.

Toward the end of this series of perspective studies, the team came up with a view “taken from [the] south end of [the] project, with [the] museum in foreground and Eads Bridge in background.”⁶⁹ The angle of the view “placed the major elements in the right relation to one another and showed their right proportion,” and “the light source was in the correct direction,

⁶⁷Ibid., SKETCH #P-3.

⁶⁸Ibid., p. 4, SKETCH #P-6.

⁶⁹Ibid., SKETCH #P-7.

and the sunny atmosphere had been chosen.”⁷⁰ After nearly one hundred sketches, the architect could be confident that this choice was the best possible (drawing no. 21, fig. 28).

Saarinén’s method for coming up with the best solution was similar to those of Labrouste and Palladio, both of which were discussed in the first chapter (figs. 21 & 22). Labrouste went through all possible parts by sketching small and abstract floor plans on a sheet of paper. Palladio drew, according to Burns, plans of the antiquities and his past projects in a rough manner to come up with a suitable organization for the project at hand. Saarinen exhausted the possibilities of perspective drawings by making nearly one hundred sketches.

In all three cases, the architect had to have patience and an inquisitive mind in order not to be satisfied with the first few alternatives he drew, as well as immense creativity to be able to come up with as many distinctive alternatives as he did. Drawing was a crucial aid to this process, for it is impossible to keep one hundred different perspective views in the mind simultaneously for comparison. By drawing, the architect could put the scheme he had just completed out of mind and work on a different one. Later, he could return to all the schemes he had produced and compare them.

Alternatives can be generated by dissatisfaction in viewing a drawing, which then helps the architect identify defects in a design, as was the case with the location of the arch in relation to the Old Courthouse and the Old Rock House. However, the method of drawing as many alternatives as

⁷⁰Ibid.

possible to come up with the best scheme involves a slightly different aspect of drawing. The architect does not necessarily focus on the drawings in sequence. Rather, his intention is to exhaust the possibilities. Even so, a look at the drawings he has completed may help him to come up with previously unimagined alternatives.

Of course, the study was done through sketches that were much more rough and abstract than the final submission drawing. However, it is not always necessary to achieve the completeness of a finished drawing for the purpose of examining its visual effect.

The final perspective was constructed with two vanishing points, one right above the Cathedral at the left end of the sheet and the other at the far right, beyond the edge of the sheet. The vanishing point on the horizon was marked with a cross in a pointed blue pencil. The viewpoint was set about 200 feet above the ground, a little higher than the Cathedral roof, the highest structure on the site except for the arch. Because of this, the horizon line was unbroken except by the arch, and about two-thirds of the arch was a striking element above the horizon in the sky.⁷¹ The arch was placed a little toward the right side of the sheet, to balance the space on the right of the arch with the many elements on the left.

Although the construction of this perspective is almost the same as a one-point perspective, the second vanishing point being at a considerable distance, two-point construction works better, giving a sense of spatial continuation to the east. The area on the right side of the drawing, with Eads bridge, the river, and the horizon, created a feeling of continuous space

⁷¹Letter from Barr to the author, May 9, 1991.

to the east. To emphasize the eastward expansion of space, the sky is drawn lighter on the right side of the sheet than the left. This depiction coincided with the intention of a future extension of the memorial to the eastern bank of the Mississippi.

The sunlight comes from the east, at a rather high angle. The shadow of the arch was cast on the ground, but not on the trees. This might be explained by the difficulty in constructing a shadow on the uneven surface of the trees and the time this would have taken to draw. Moreover, if it had been drawn, the arch might have become an overpowering structure, creating an ominous presence over the tree-shaded park.

The drawing was done with prismacolor pencils, making the imagined view of the site more attractive to the eye and probably rather more believable than the neutral black and white drawings. Among the other four finalists, only Harris Armstrong used color in his perspective drawing: He used a black and white aerial photograph for the area surrounding the competition site and applied watercolor for his design (fig. 32).

The Arch as a Striking Element

The main objective in drawing this perspective (drawing no. 21, fig. 28) seems to have been to depict the arch as a striking element. In addition to a viewpoint chosen to make the arch rise above the rest of the complex, the renderer distinguished the arch from the rest by his drawing technique. Here, the rest of the design elements, as well as the context surrounding the site, were treated as background for the arch.

The overall unity of the drawing was maintained by closely spaced, blue vertical pencil lines.⁷² This technique was commonly used in the office of Eliel Saarinen. The actual rendering of this final perspective drawing was done by J. Henderson Barr, the renderer in the office.

To help focus viewers attention on the arch, special attention was given to the arrangement of the trees. The majority of the trees in the perspective are broad leaved. These trees are colored moss green, green, and yellow, and the strokes are all vertical. Additionally, the drawing employs light blue for the sunlit area, dark blue for shadows, and dark brown for trunks. However, there is one exception: Right below the north foot of the arch, three pine trees are drawn (fig. 106). In comparison to the other trees that compose the forest, these three trees are drawn darker and higher. They help to draw the viewer's attention to the arch.

While drawing blue vertical lines over virtually the entire sheet, the renderers made an exception and left out the area of the arch. This makes the arch stand out from the background.

The arch itself is left blank, except for some blue and dark blue splashes to create the effect of the sun shining from the southwest on the flat metal sheet. The strokes are even, in contrast to all other areas of the drawing.

In this perspective, unlike earlier studies, the arch was drawn with a triangular section. The sharp edge of the triangle was represented in an emphatic manner in this perspective, by the effect of the light and shadow created by the strokes of blue pencil.

⁷²Ibid.

Design of Details on Final Sheet

Even during the production of presentation drawings, some aspects of the design were spontaneously revised as the delineator drew. Certain qualities of the design had simply never emerged before the architects' eyes in previous drawings.

A number of examples of changes in detail are found in both the perspective drawing and the orthogonal drawings for the second-stage submission. In the final perspective drawing, one finds some aspects of the design that did not appear in the plan, elevation, or section on the other submission sheet.

For instance, the architect only designed the windows of the museum during the drawing of the final perspective. The plan and the elevation showed no windows. The observation windows located at the top of the arch were also shown in the perspective, but not in the elevation, which in any case was too small in scale. The design of the houses of Old St. Louis was changed to suit the viewpoint of this perspective drawing. In the plan drawing, they were depicted as a row of houses with a single roof structure. In the perspective, walls were inserted between each house and the roof line was broken up (fig. 107).

Among the elements determined while drawing the perspective, some were established merely to improve the drawing's visual effect. The number of circular roofs over the museum terrace was increased, and the trees in the Museum courtyard were shifted toward the right in the

perspective drawing (fig. 108). This was to adjust for the distortion of the perspective drawing, and had nothing to do with the design itself.

The visual effect of the drawing also caused the renderers to adjust the direction of the sun between the plan and the perspective. Whereas in plan the shadow of the arch was cast on the levee and the river in order to create a visual effect, in perspective, the sunlight was redirected, and the shadow of the arch over the forest was avoided. Although Saarinen wanted to keep the direction of the sun realistic, as seen earlier, he did not mind having the plan and the perspective show two different sunlight angles.

Second-Stage Judgment

The jury and the professional adviser met again in the Old Courthouse on February 17-18, 1948. On the morning of the first day, the program and the addenda were studied, to clarify the requirements. Wurster, the chairman of the jury, pointed out four important elements to look for in the designs: the tree-shaded park, the memorial, the buildings, and the possibility of a gradual development of the site. Then Howe stressed the importance of a memorial of striking design and monumental character. The jury members viewed all five designs and made some comments.

On the afternoon of the same day, the chairman suggested an anonymous trial ballot, if only to see the general trend of opinion. However, this turned to be the final one: Design no. 144 received a unanimous vote, and was determined to be the winner.

The jury's final report praised Saarinen's monument as being "of that high order which will rank it among the nation's greatest monuments," and commended the "inevitable quality of a right solution" in the treatment of all the features, including the Old Rock House as the entrance to the arch, the tree-shaded park, the approach and adjacent area of the Old Cathedral, the sculpture courts, the frontier village, and restaurants.

The winning design was in a way Saarinen's answer to the problem that Sigfried Giedion had set forth several years earlier:

Every period has the impulse to create symbols in the form of monuments. ... This demand for monumentality cannot, in the long run, be suppressed. It will find outlet at all costs.⁷³

Certainly, the impulse within Saarinen for a great monument could not be suppressed, for he continued to work on the design of his monument even after winning the competition.

He built models, and rebuilt them, studying them with mirrors, photographing them, and rebuilding them again, heightening the arch from the original 590 to 630 feet, then drawing its profile inward in a further refinement, until he arrived at the magnificent final form.⁷⁴

There were, of course, numerous aspects of the design that had to wait for the post-competition stages to be explored. One of them was the material of the arch. It had been drawn like a sculptural object with a continuous shiny metal mass in all four sheets of submission drawings. However, the reality was that the surface of the arch had to consist of a number of units, which

⁷³Sigfried Giedion, "The Need for Monumentality," in New Architecture and City Planning (New York: Philosophical Library, 1944).

⁷⁴Temko, Eero Saarinen (New York: George Braziller, 1962), p. 127

would inevitably reveal joint lines. This fact of construction was not recognized, or at least not acknowledged, during the competition. The joint lines were finally drawn on the working drawings, when the scale was blown up to 1/8"=1'-0".

Saarinen knew the distinction between an idea when it was only in the mind and an idea after it had taken form in drawing. He wrote to Luther Ely Smith of the Association in late May 1948:

Dear M. Smith:

Thank you again.

You have had this great dream for St. Louis for many years. While the picture of just how it looked physically may well have been hazy, yet, through this very fact, I am sure it was greater and more beautiful than anything can be when it is put down on paper and is built.

It happened to be our lot to crystallize it on paper, but, at the same time, we realize that it is a comedown from something much finer. When the project someday becomes a reality, we will remember this and, by refinement of detail, we will try to gain some of what has been lost by stepping down from a great dream to reality.⁷⁵

Saarinen stressed here the higher quality of the idea in the mind. However, at the same time, it must have been clear to Saarinen that the architect who put the idea down on a sheet of paper was the one who could make the idea visible and convert it into reality.

⁷⁵Letter from Saarinen to Smith, dated May 28, 1948, KR.

CONCLUSION

Throughout the development of Saarinen's design in the Jefferson National Expansion Memorial Competition, I have traced the roles that drawings played in generating the design. Having done so, I can offer further clarification of the concept "to generate a design," possibly the expression that has occurred most frequently throughout this text. There are at least three distinguishable meanings in the word "design." The first is a design as a process, the second as a product, and the third as an image in the mind of man, which may or may not be represented in a drawing.

Under the first meaning, design as process, it would be an overstatement to suggest that drawing brought into existence Eero Saarinen's design in the Jefferson National Expansion Memorial Competition. Among the origins of the design were the competition program and the monuments in Washington, D. C., that inspired Saarinen.

Design, in this research, should not be taken to mean a product, especially one with physical substance. Often, in daily use of the word, design does mean such a product. However, at least in connection with the expression "to generate a design," the term "design" in this study was assigned to mean a mental image. The physical product, by contrast, was identified as a drawing.

With this understanding, the concept of drawing generating design can be further specified. In some cases, "design development" may be a

more precise expression to describe the situation. A particular direction in which to further elaborate the design, which may not have been consciously recognized by the architect, can be suggested by drawing. In the case of Saarinen, a new interpretation of a drawing, which recognized the arch as a gateway to the West, encouraged the monumental quality of the design.

At other times, the need for a design change can be envisioned through drawing. In the case of Saarinen, for example, the idea of altering the location of the arch came to him through drawing an elevation. The second-stage addenda required that the Old Rock House be preserved. With the plan alone, he would not have realized the ungainly relation of his lofty monument to this small structure. As a result of drawing the elevation, he relocated the arch so that one of its feet was near the Old Rock House.

Some of the drawings that generated the design have been lost and can only be reconstructed through the architect's comments and later drawings. At times, design changes and developments grew out of models, another way of representing a design physically and visually, rather than drawings. In order to see the five ways in which drawing generates design, one has to accept these instances as evidence and apply the power of inference to them. With this proviso, the case presents all five: First, drawing can elaborate an ambiguous design to more concrete. Second, multiple interpretation of a drawing, either conflicting with the original or not, can offer a particular design development. Third, drawing can suggest design alternatives, sometimes by clarifying the particular problems of the design, other times by helping the architect exhaust the possibilities of design. Fourth, drawing can bring an unforeseen issue to light and force the

architect to consider it. Lastly, drawing can concretize an accidental, unintended form before the eyes of an architect.

The elaboration of Saarinen's design from ambiguous to more concrete occurred when the idea of a dome, abstracted from the Jefferson Memorial in Washington, D. C., advanced toward a particular form through model-making. Saarinen and his team members tried to make a model on a map of the St. Louis riverside on the living room floor. Pipe cleaners, the only things at hand with which to build, led the architects in the direction of a three-legged, open dome.

A new interpretation of Saarinen's drawings suggested a design development. Saarinen's friends associated the arch with the notion of a gateway, a concept that had not existed either in the architect's mind or in the competition program. The arch ultimately became taller and narrower in span to carry this new meaning. This interpretation worked without conflicting with what the architect had had in mind. Rather than having to discard some earlier aspects of his design, the architect elaborated the form of his arch upon this new interpretation.

At various stages, Saarinen's examination of the drawings made him recognize certain problems in his design. A new set of design issues was generated at those times. The architect then came up with design alternatives so as to resolve the particular issues. In the early stage of design, Saarinen had the arch toward the northern end of the site. In the plan, however, the arch looked lonely to him. He relocated the monument so that it stood about in the middle of the north-south length of the site, thereby relating it visually to the Old Courthouse.

Sometimes Saarinen consciously and intentionally made an effort to exhaust alternative schemes in order to arrive at the ultimate resolution. For this process, it is necessary first to come up with numerous alternatives, and second to compare them. Drawing creates records of such alternatives as they come to the architect's mind; he does not have to worry about forgetting the schemes that came to mind earlier. In addition, drawing helps to exhaust the possibilities. The architect can conceive one scheme after another, changing the design slightly by looking at the drawings he has already produced. Finally, drawing allows him to compare all the alternatives together, a task that would be impossible by memory alone. An example at hand concerns the viewpoint and atmosphere in the final perspective drawing. Saarinen drew nearly a hundred perspective sketches in order to come up with the best scheme.

In some cases, a particular design issue arose without Saarinen's intention, but out of the depiction specific to the type of drawing in use. In the basement floor plan, the horizontal section of the arch grew from an unquestioned matter to an important design consideration.

Related to this fourth way of generating design was Saarinen's deliberate use of drawing to isolate some aspects of his design while suppressing others. By this method, he could concentrate his attention on examining selected issues and, at the same time, succeed in preserving economy of time and effort in drawing. For example, he tested the visual effect of a submission sheet on a smaller sheet using techniques that were less elaborate but sufficient for study.

Accidental products also played a role in generating design. Although it was not Saarinen's ultimate goal in model-making, a two-legged dome, or arch, appeared before his eyes. Rather than overlook it as an intermediary product, he took it to holding a possibility of design development.

In addition to the aforementioned five categories, there have been other findings in this research concerning the relationship between design and drawing. The most important is this: An ambiguous drawing is not necessarily the counterpart of an ambiguous state of the idea in the architect's mind. An example of this was the architect's sketch made on a trip and addressed to his office staff. Although the lines were ambiguous, Saarinen meant specific design, and his office staff who had been working with him and knew the direction of the design interpreted that specific design.

Among the five ways in which drawing generated design, some were observed more often than others in the design of the St. Louis memorial. This difference in frequency can be taken as something particular to this design case and peculiar to Saarinen's designing process. In contrast to a self-confessed doodling architect like Graves, Saarinen had a rather clear and specific idea about his design when he drew. However, Saarinen did not take the drawing as a simple correlate of his design. Instead, he welcomed other architects' interpretation of his drawings. He was also constantly attempting to find any unsatisfactory elements through the act and product of drawing. By these methods, he succeeded in coming up with a new set of issues that he had not foreseen.

I expect that every architect has his own way of using drawing to generate design. The extent of variation will only be proven when other cases are investigated, but that is outside the scope of this research. Nonetheless, after seeing how much drawing contributed to the design of a simple arch, it is reasonable to assume that many architects rely on representation in order to generate design.

At the time when fantastic and dramatic animation of three dimensional spaces is made possible by computer graphics, small children have forsaken making sand castles in the playground to engage in video games on hand-held minicomputers. High-density television waits to take center stage in the consumer electronics market, and with it computer graphics promise to create what is called virtual reality, hardly distinguishable from the genuine article. This has of course affected the work of architects and may be expected to do so at an increasing pace. Computer graphics invite some further thought about the nature of drawing in the profession.

Drawing may be called the architect's language. Writing gives substance to thoughts; drawing substantiates mental images. Drawing is not only a language to communicate, but a language to represent. Communication here means the transmission of a set of information, nothing less, nothing more. Representation produces a physical object out of a mental image, and yet the object that represents is not a simple correlate of what is represented. In this feature of representation lies the power of drawing to generate design.

So far, the contribution of computer graphics seems to be limited strictly to the realm of drawing as communication. If drawing's only role were to communicate a design to builders, then computer-generated orthogonal or axonometric drawings would be sufficient. These projections keep length true to its object, enabling the builders to construct accordingly. The specifications of the materials can be added to these drawings in writing and other graphic symbols. The computer might do a better job, producing precise lines according to prescribed line weight. Better yet, it is probably more economical and efficient than human labor.

If drawing were just to convince the client of a design, then perspective drawings accompanied by floor plans would do the work. These drawings are close to the conventional experience of looking at a building and walking its floors. It would be better still if a number of perspectives were presented in a continuous sequence by the use of computer animated graphics.

However, drawing is not merely the architect's means to communicate. The two cases above assume that the architect has already finished designing the building, and that the design needs only to be accepted as is by the client and to be constructed by the builders. In reality, the greater part of the architect's raison d'être lies in designing, and moreover, the designing continues to take place even after the client's acceptance or during construction.

What kinds of architectural drawings are most helpful in designing? They are not necessarily a series of artful pictures, in whose production a computer may be so useful. Dazzling perspectives may excite a client, but a

different kind of drawing, which Werner Oechslin aptly named "the well-tempered sketch,"¹ may prove more beneficial to generating design. As so often happened in Saarinen's case, an incomplete drawing may encourage a dissatisfied architect to study his design further, or an imprecise sketch may encourage multiple interpretations. The human hand, which does not always perform as expected, may end up generating an image that had not been anticipated. Or, by struggling to produce a drawing by fitting an image of something three-dimensional into a certain two-dimensional projection, an architect may discover an issue that he had not recognized as existing.

I am not suggesting here that computer graphics cannot produce representation that can possibly generate design. Most probably, with the proper development of technology and well-designed programming, the computer would be capable of possessing such abilities. The computer is, after all, a tool. Every tool needs a person to use it.

This brings up a crucial issue in this dissertation. Although drawing has been advocated here as something that has the power to generate design, in the final analysis this is a metaphorical perception of truth. It is in fact the unpredictable human mind, stimulated by the drawing, that actually generates design. Without the active mind of an interpreter, the drawing remains inert.

The profession of architecture has, throughout history, moved toward narrower specialization, from a master builder who was knowledgeable and skilled both in theory and practice to a man in a suit

¹Werner Oechslin, "The Well-Tempered Sketch," in *Daidalos*, no. 5 (1982), pp. 99-112.

confined in an office building between his desk and a meeting room. In this setting, more than ever, architects need to draw, needs to make. Through the production of drawings, architects are still able to formulate, change, and elaborate such complex mental images as architectural designs. In the realm of architecture, imagination grows out of the experience of making.



Fig. 2. Louis I. Kahn. 1959 St. Cecile Cathedral, Albi, France. 8 3/8 inches x 10 1/4 inches, ink on paper.
SOURCE: Nathaniel Kahn.

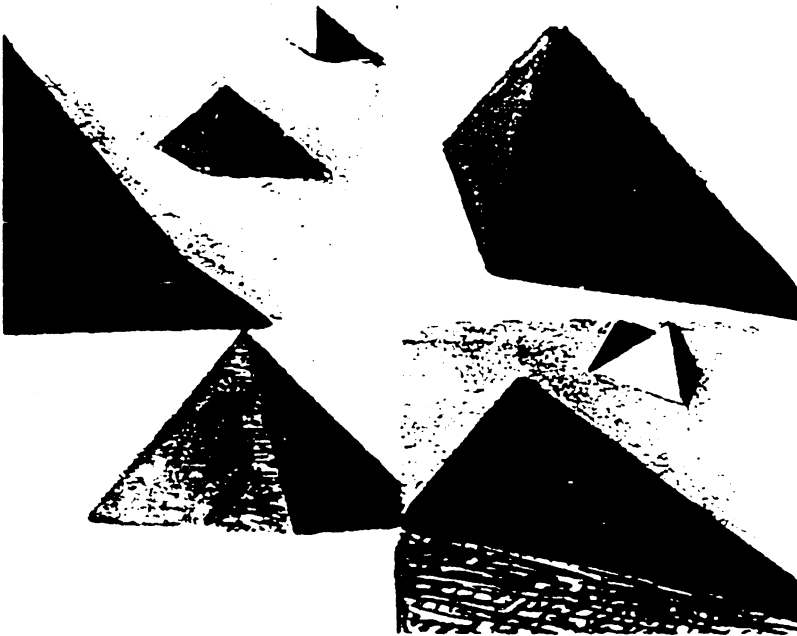


Fig. 3. Louis I. Kahn. Pyramids, Giza, January 1951. Pastel and charcoal on paper, 28 x 37.5 cm.

SOURCE: Sue Ann Kahn.

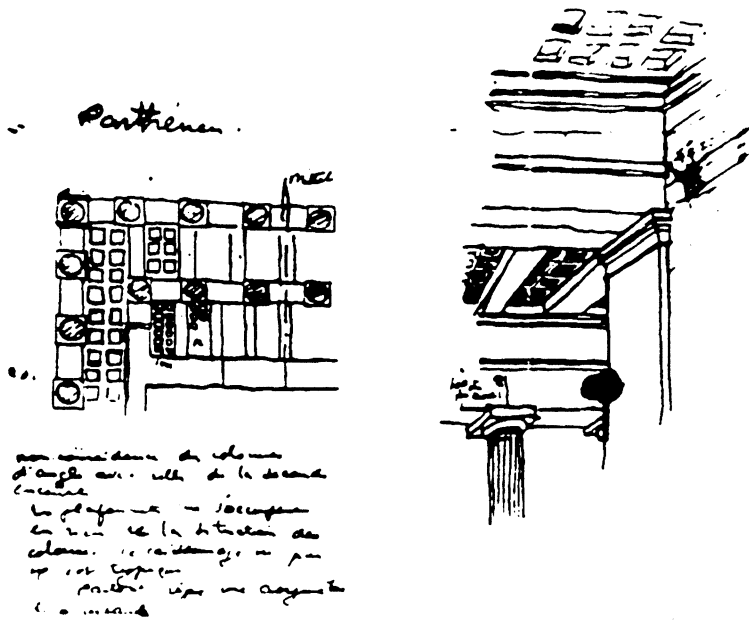


Fig. 4. Le Corbusier. Details of the Parthenon's ceiling and columns.
SOURCE: Le Corbusier, Journey to the East (Cambridge: The MIT Press, 1987), p. 227.

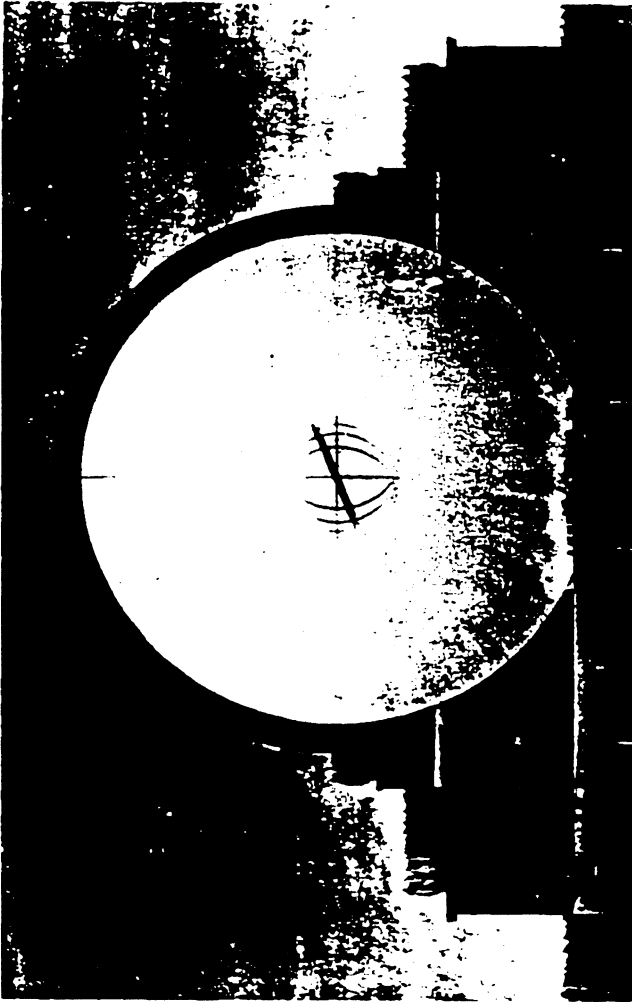


Fig. 5. Etienne-Louis Boullée. Cenotaph for Newton, section.
SOURCE: Bibliothèque Nationale, Paris.

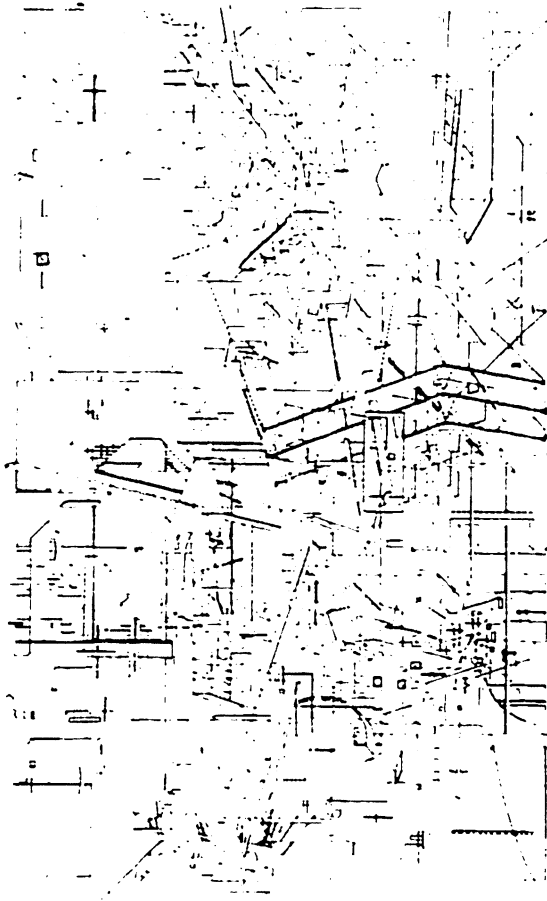


Fig. 6. Daniel Libeskind. Micromegas-Time Sections.
SOURCE: Libeskind, Between Zero and Infinity (New York: Rizzoli, 1981), p. 83, fig. 12.2.



Fig. 7. Codex Coner. Tempietto, San Pietro in Montorio.

SOURCE: Wolfgang Lotz, Studies in Italian Renaissance Architecture (Cambridge and London: The MIT Press, 1977), p. 50, fig. 10.

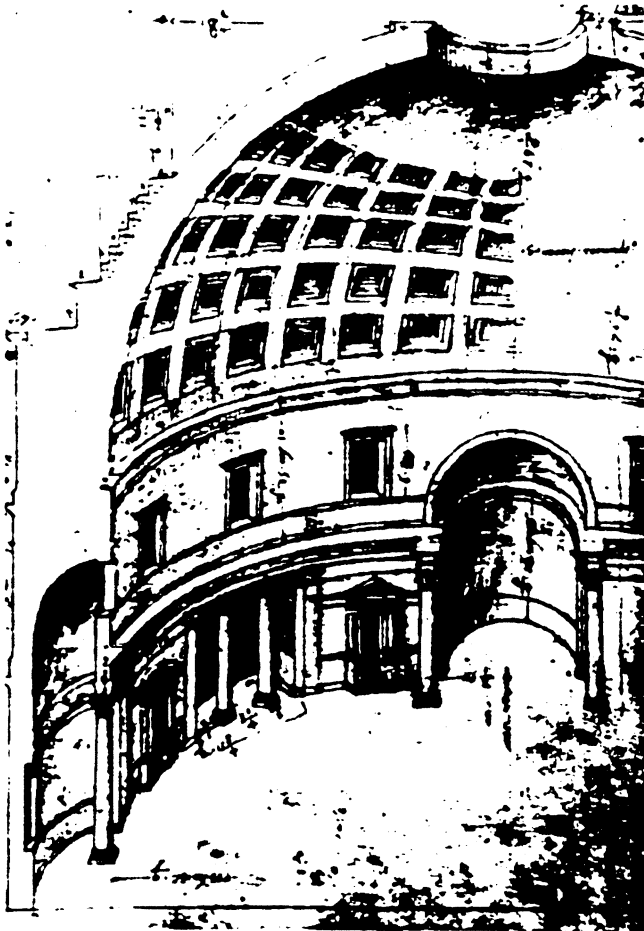


Fig. 8. Codex Coner. Pantheon.
SOURCE: Lotz, p. 51, fig. 12.

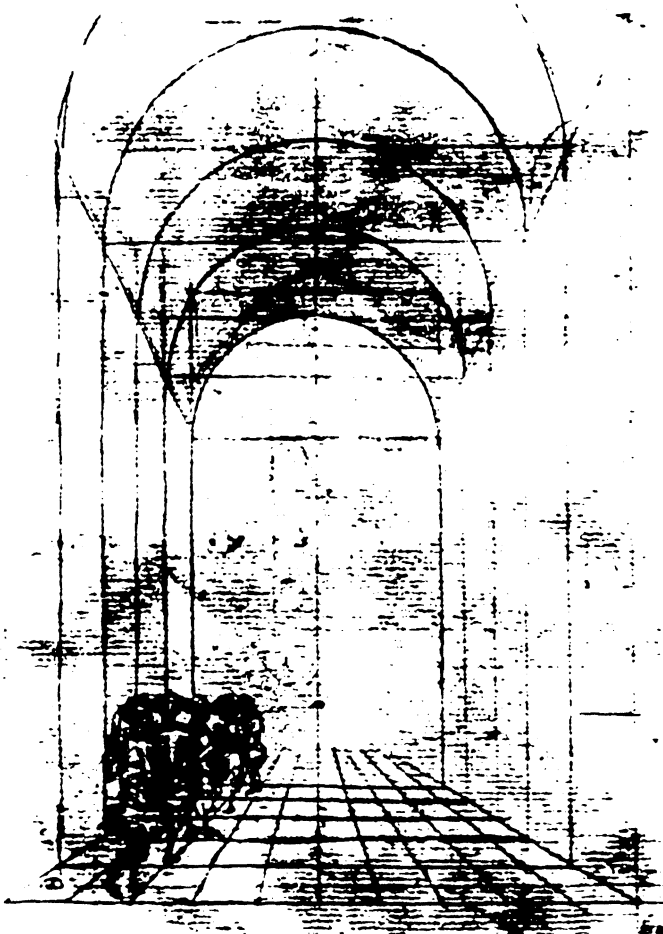


Fig. 9. Pisanello. Drawing of an interior.
SOURCE: Lotz, p. 43, fig. 2.

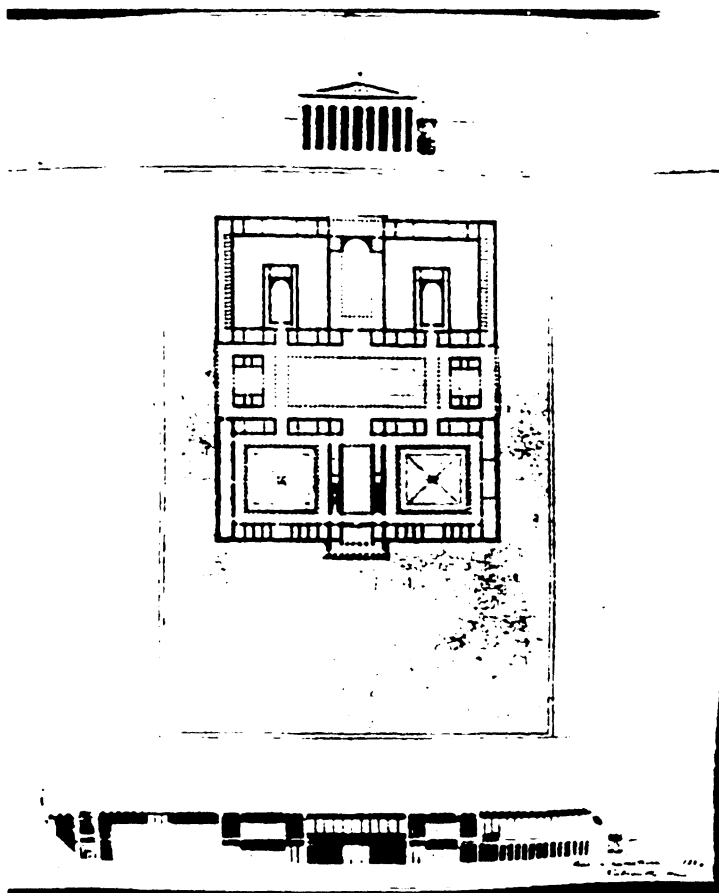


Fig. 10. Henri Labrouste. Cour de Cassation, 1824, sketch elevation, plan and section.

SOURCE: Robin Middleton, ed., The Beaux-Arts and Nineteenth-Century French Architecture (Cambridge: The MIT Press, 1982), p. 89, fig. 72.

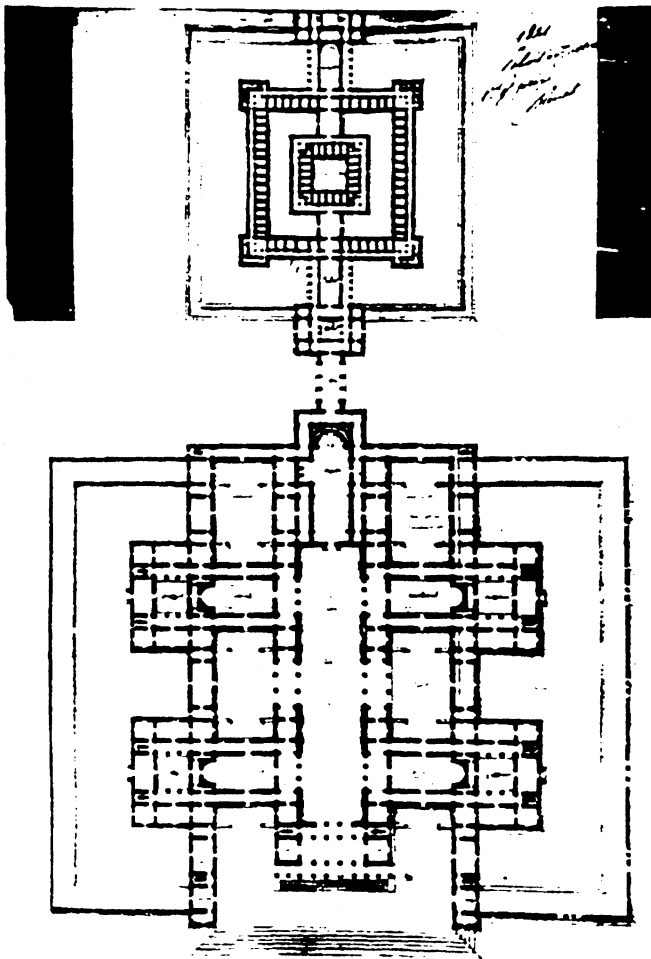


Fig. 11. Abel Blouet. Palais de Justice pour le Chef-lieu d'un Département, 1821, sketch plan.

SOURCE: Middleton, p. 100, fig. 81.

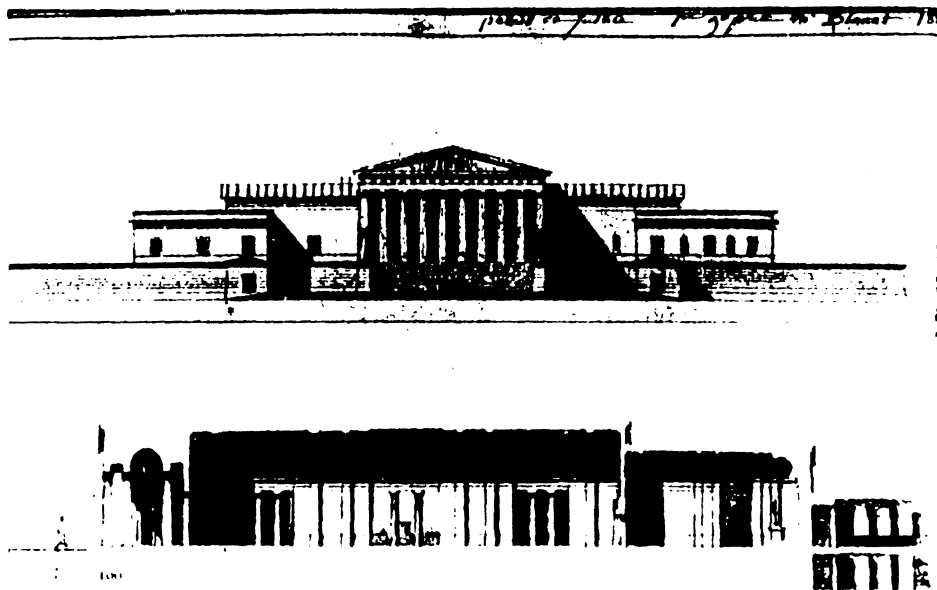


Fig. 12. Abel Blouet. Palais de Justice pour le Chelieu d'un Département, 1821, sketch elevation and section.
SOURCE: Middleton, p. 100, fig. 82.

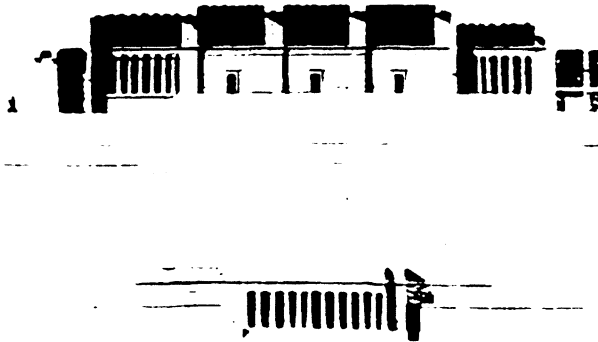
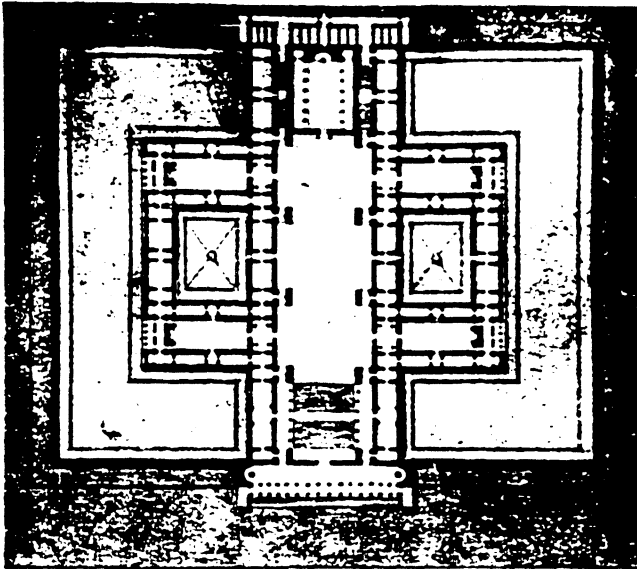


Fig. 13. Henri Labrouste. Palais de Justice, 1821, sketch plan, section and elevation.
SOURCE: Middleton, p. 101, fig. 83.

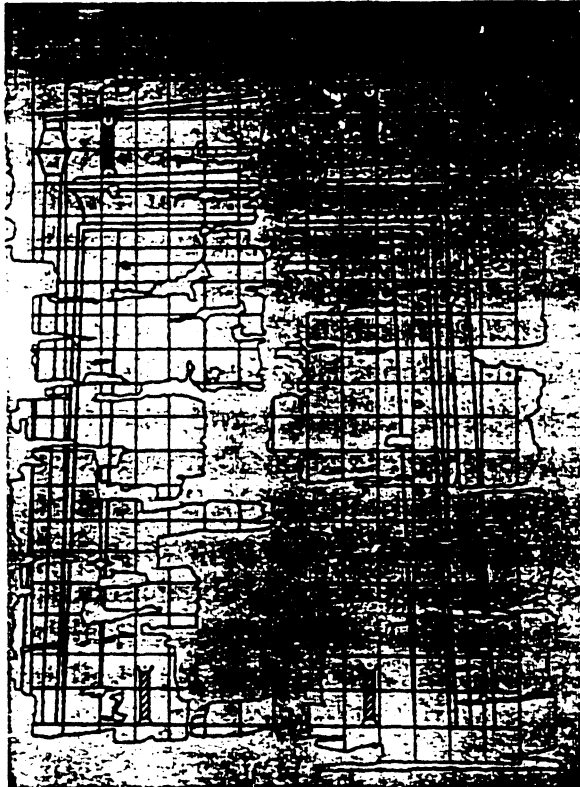


Fig. 14. Side elevation from a shrine; Egyptian papyrus drawing from Ghorab, probably from XVIII Dynasty.
SOURCE: Spiro Kostof ed., *The Architect: Chapters in the History of the Profession* (New York: Oxford University Press, 1977), p. 8, fig. 1. (Turin, Museo Egiziano, line drawing by R. Tobias)



Fig. 15. Bird's-eye view of an Amarna palace in a painting from the tomb of Mery-Re, high priest of Aten; XVIII Dynasty

SOURCE: Kostof, p. 9, fig. 2. (N. de G. Davies, The Rock Tombs of El Amarna, I, London, 1903, pl. XXVI)

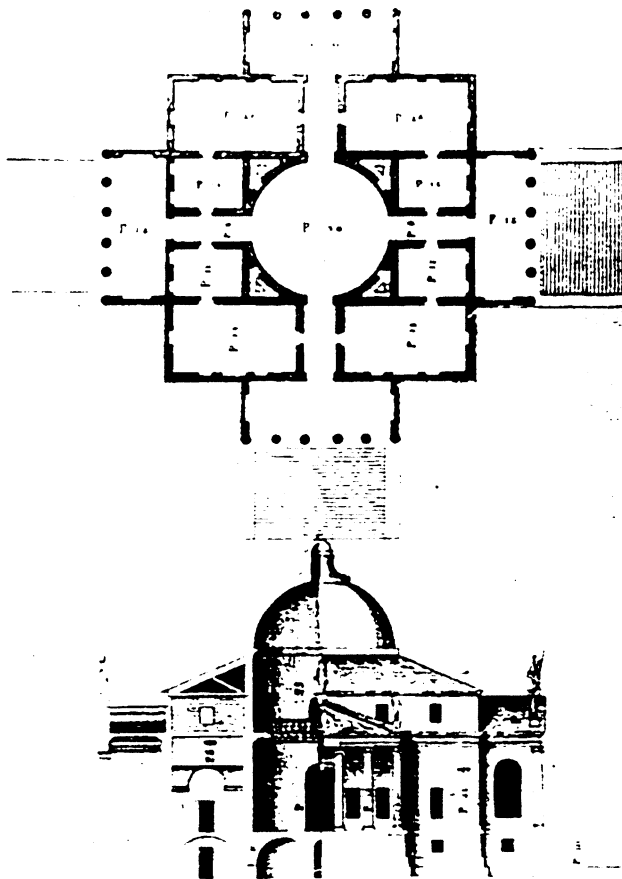


Fig. 16. Andrea Palladio. Bk. II, pl. XIII.

SOURCE: Palladio, The Four Books of Architecture (New York: Dover Publications, 1965)



Fig. 17. Albrecht Dürer. The "velo" in the "Artist drawing a Lute," 1525.
SOURCE: France Borsl, Leon Battista Alberti: The Complete Works (New York: Rizzoli, 1989), p. 203, fig. 213.



Fig. 18. Auguste Choisy. Palatin. From "L'Art de Bâtir chez les Romains".
SOURCE: Yve-Alain Bois, "Metamorphosis of Axonometry" in Daidalos,
no. 1 (1981), p. 42.

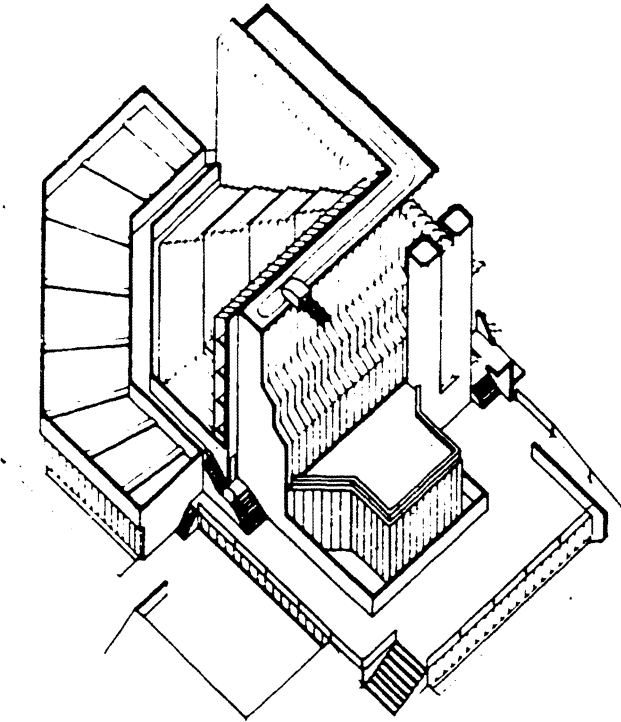


Fig. 19. James Stirling. Cambridge University History Building, axonometric, 1964.

SOURCE: Arthur Drexler ed., The Architecture of the Ecole des Beaux-Arts (New York: The Museum of Modern Art, 1977), p. 20.

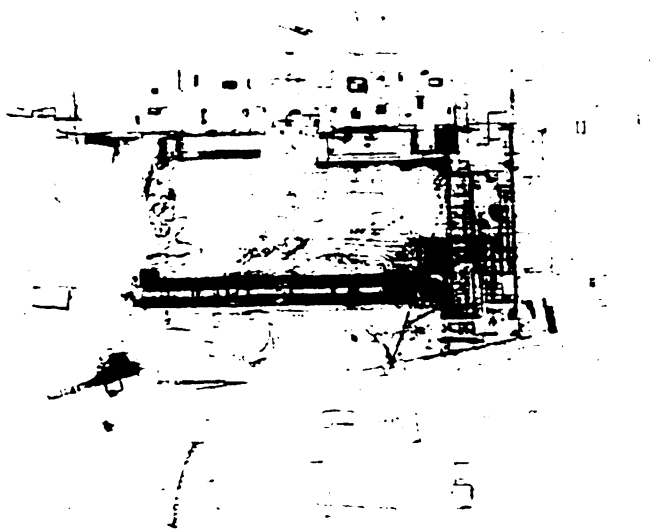


Fig. 20. Carlo Scarpa. Castelvechio. Proposals for the great courtyard and the placing of sculptures in the adjacent gallery.

SOURCE: Richard Murphy, Carlo Scarpa and the Castelvechio (London and Boston: Butterworth Architecture, 1990), p. 15, fig. C1.

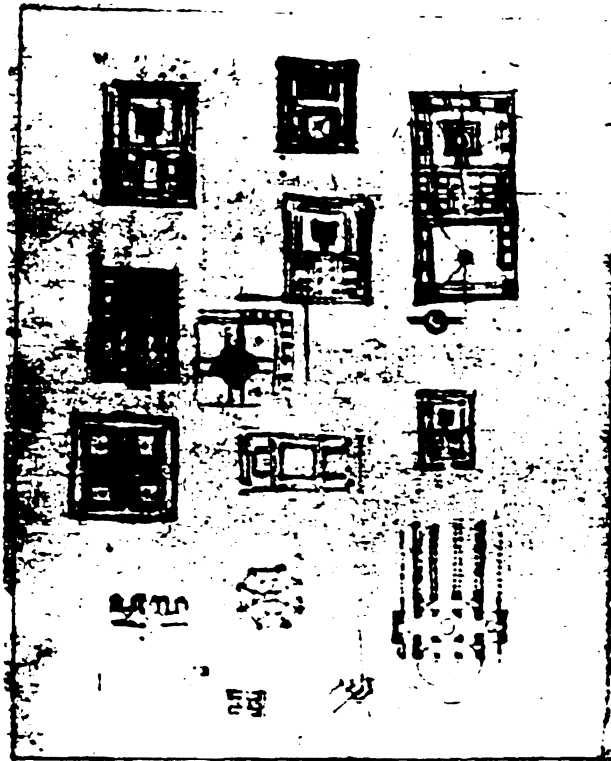


Fig. 21. Henri Labrouste. Sketch plans on an unidentified subject, c. 1824.

SOURCE: Middleton, p. 95, fig. 79.

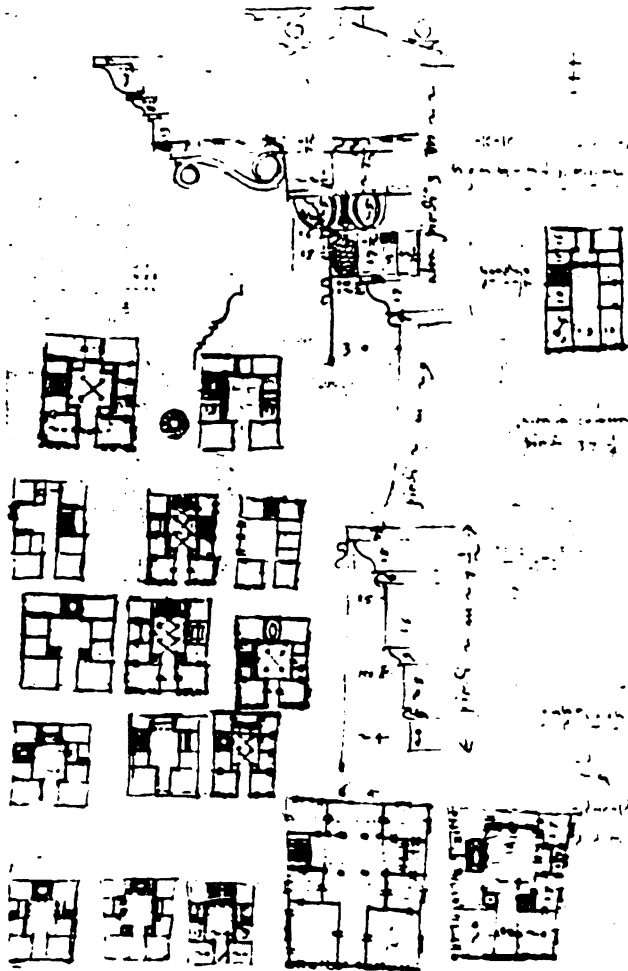


Fig. 22. Andrea Palladio. Twenty tiny alternative plans for a palace and a sketch of the entablature of the temple of Venus Genetrix.
 SOURCE: Howard Burns, "The Lion's Claw: Palladio's Initial Project Sketches," in *Daidalos*, no. 5 (1982), p. 76.

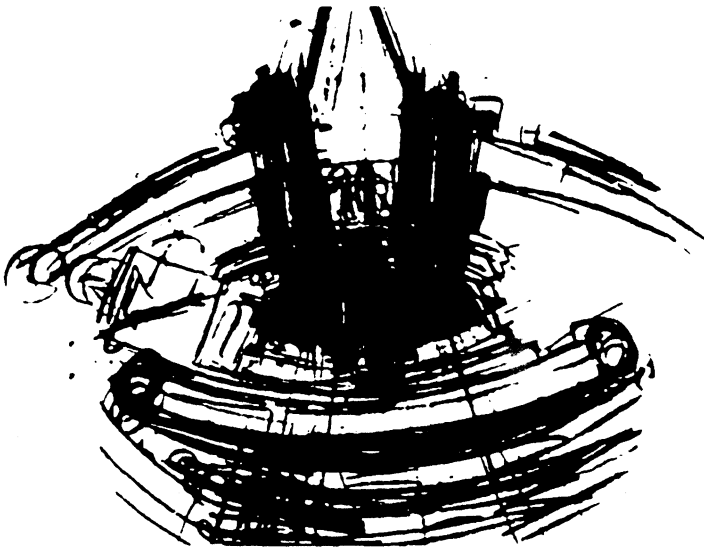


Fig. 23. Constant Désiré Despradelle. Part of the competition of the architectural exhibition of 1908, University of Pennsylvania in Pittsburgh. Rough sketch of the whole composition in charcoal.
SOURCE: Werner Oechstin, "The Well-Tempered Sketch," in *Daidalos*, no. 5 (1982), p. 111.

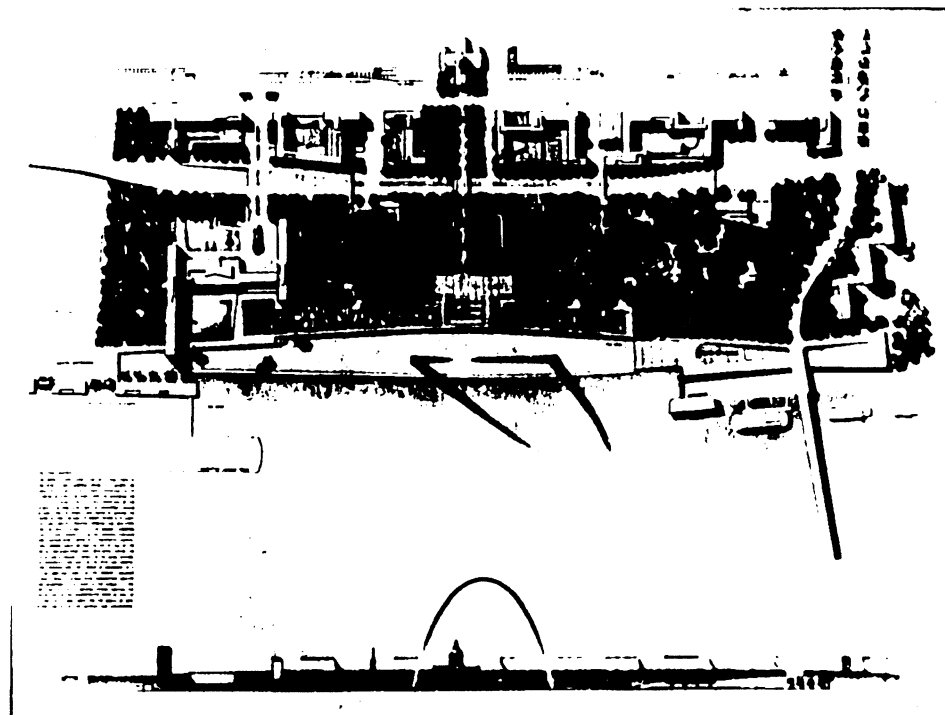


Fig. 24. Eero Saarinen. First-stage submission, sheet A, only available in photographic reproduction. Drawing no. 7 is the original of this submission sheet.
SOURCE: Jefferson National Expansion Memorial Archives, National Park Service, St. Louis, MO (JNEM, hereafter).

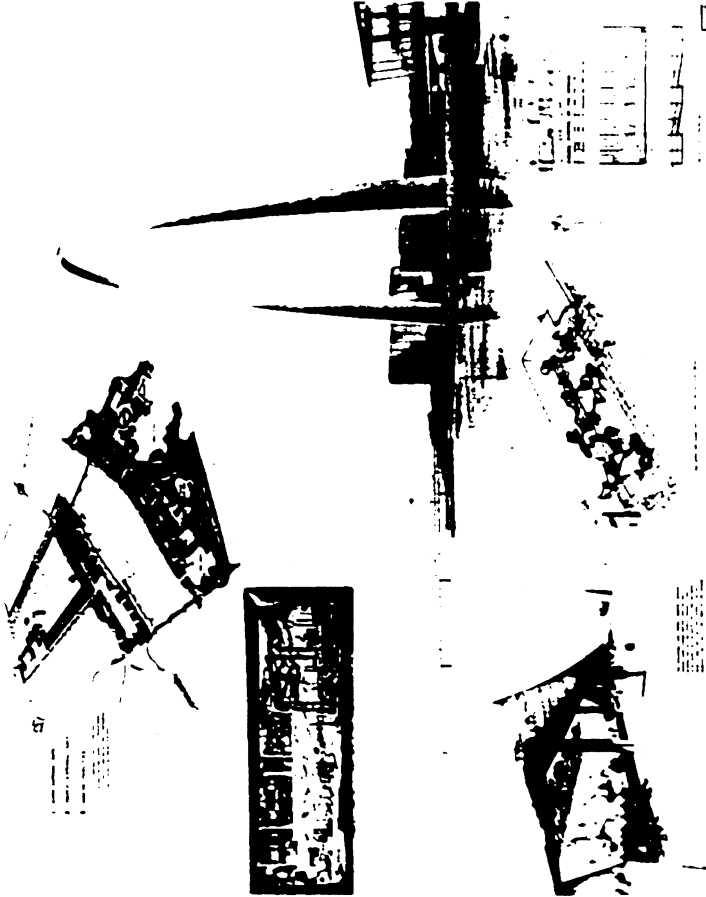


Fig. 25. Eero Saarinen. Drawing no. 9: First-stage submission, sheet B.
SOURCE: JNEM.

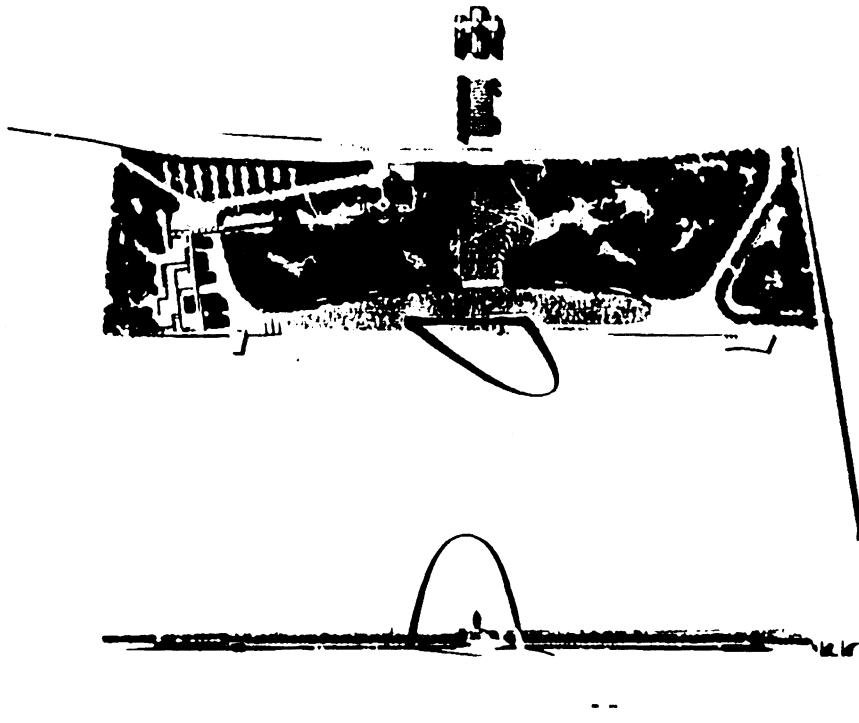


Fig. 26. Eero Saarinen. Drawing no. 15: Second-stage submission, sheet A without overlay.
SOURCE: JNEM.

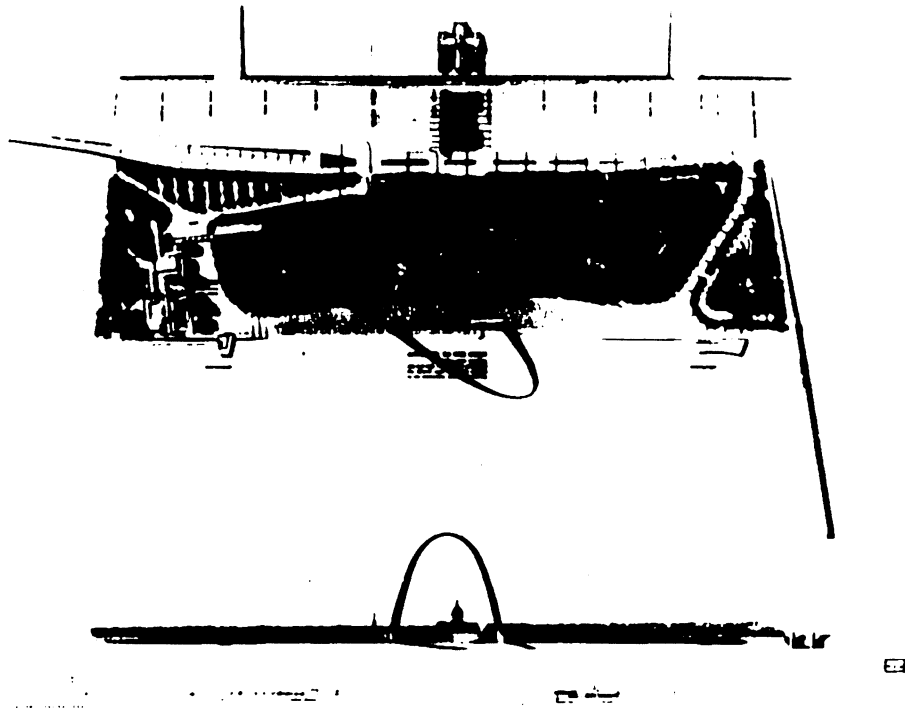


Fig. 27. Eero Saarinen. Second-stage submission, sheet A with overlay.
SOURCE: JNEM.



Fig. 28. Eero Saarinen. Drawing no. 21: Second-stage submission, sheet B.
SOURCE: JNEM.

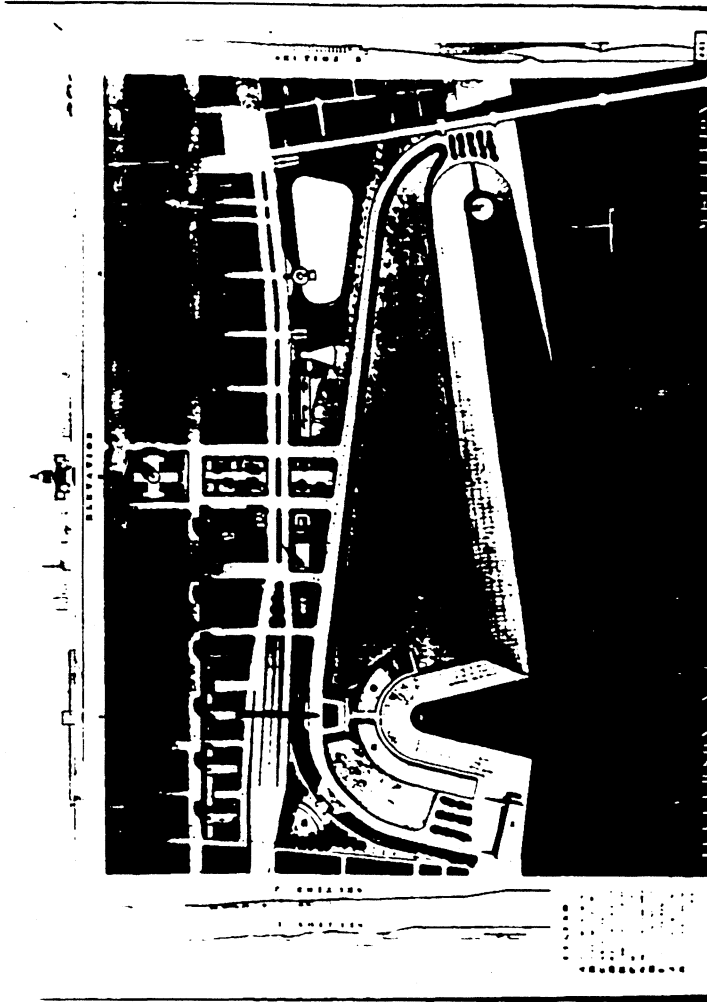


Fig. 29. Harris Armstrong. First stage, sheet A.
SOURCE: JNEM.



Fig. 30. Harris Armstrong. First stage, sheet B.
SOURCE: JNEM.

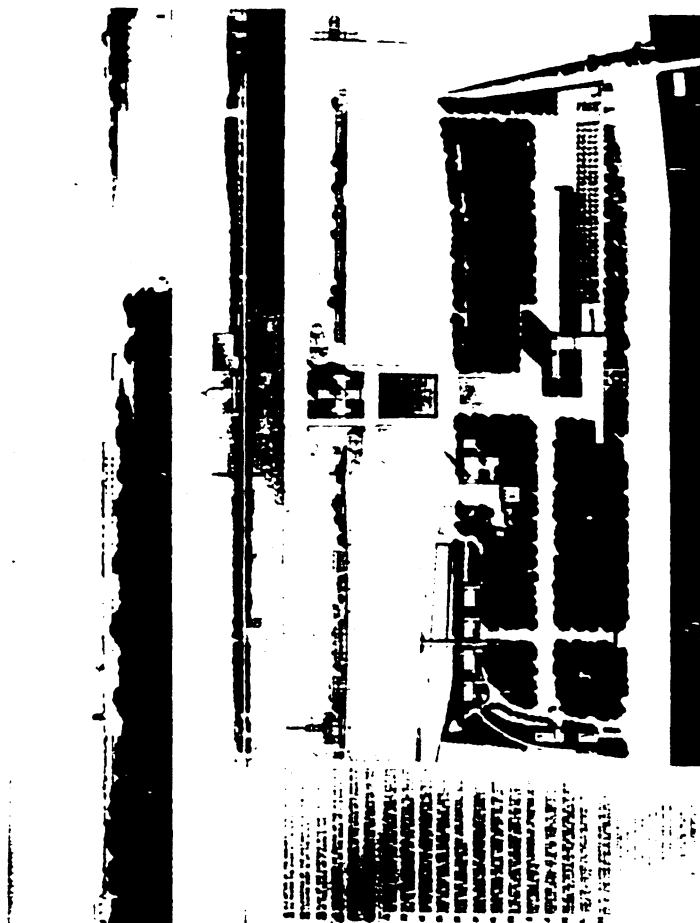
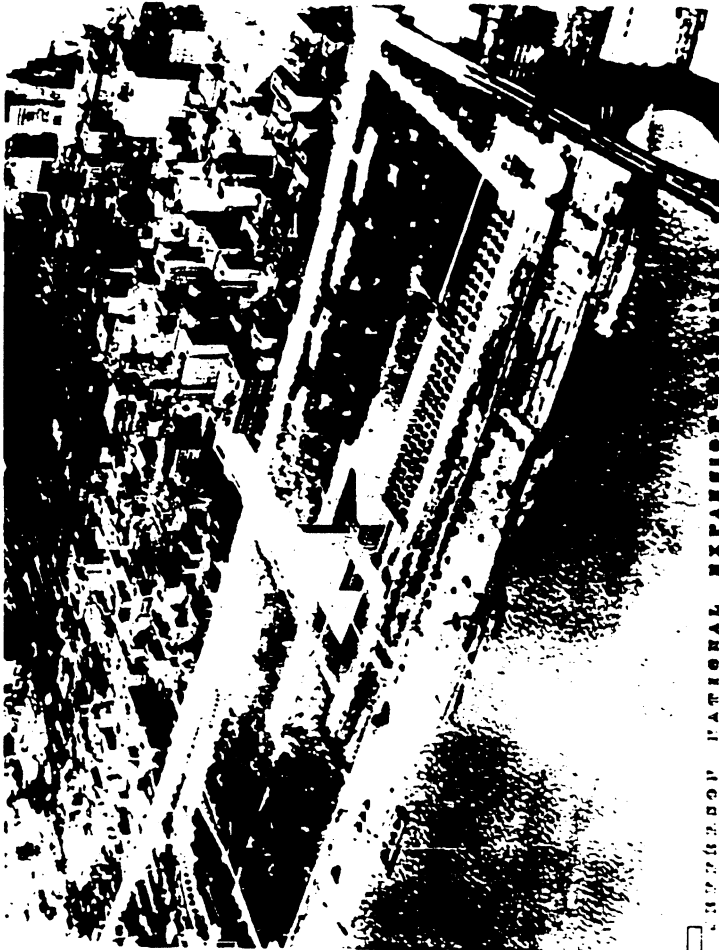


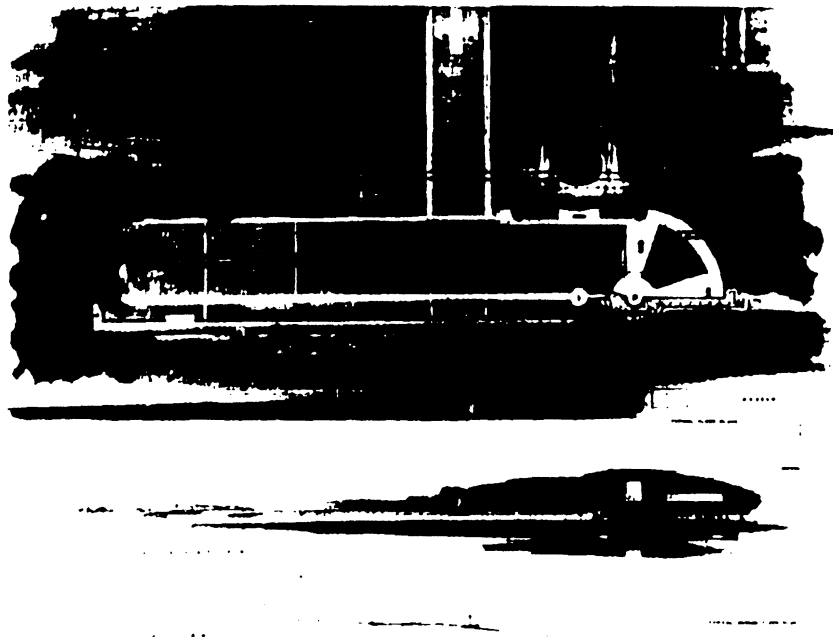
Fig. 31. Harris Armstrong. Second stage, sheet A.
SOURCE: JNEM.



U.S. GOVERNMENT NATIONAL EXPANSION PROJECT

Fig. 32. Harris Armstrong. Second stage, sheet B.

SOURCE: JNEM.



JEFFERSON NATIONAL EXPANSION MEMORIAL

Fig. 33. Gordon A. Phillips. First stage, sheet A.
SOURCE: JNEM.

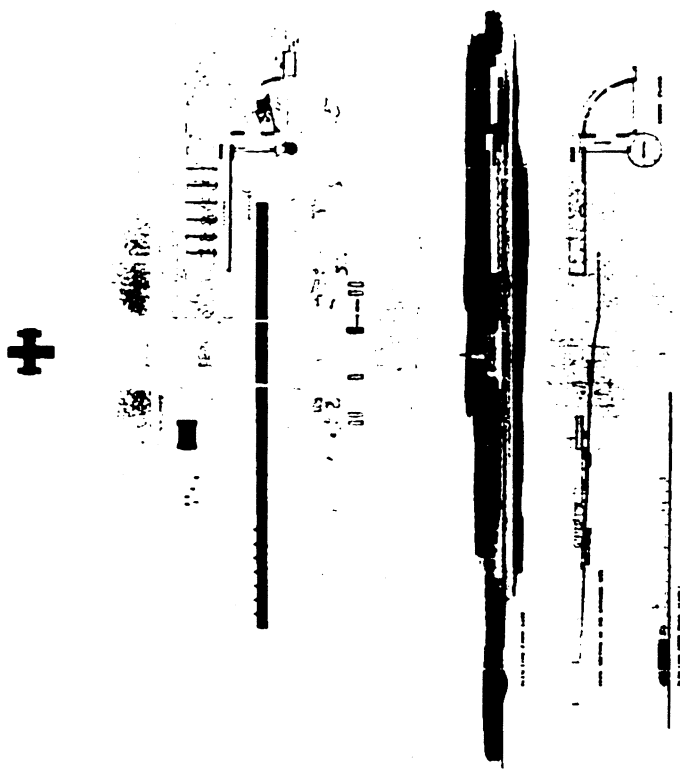


Fig. 35. Gordon A. Phillips. Second stage, sheet A.
SOURCE: JNEM.

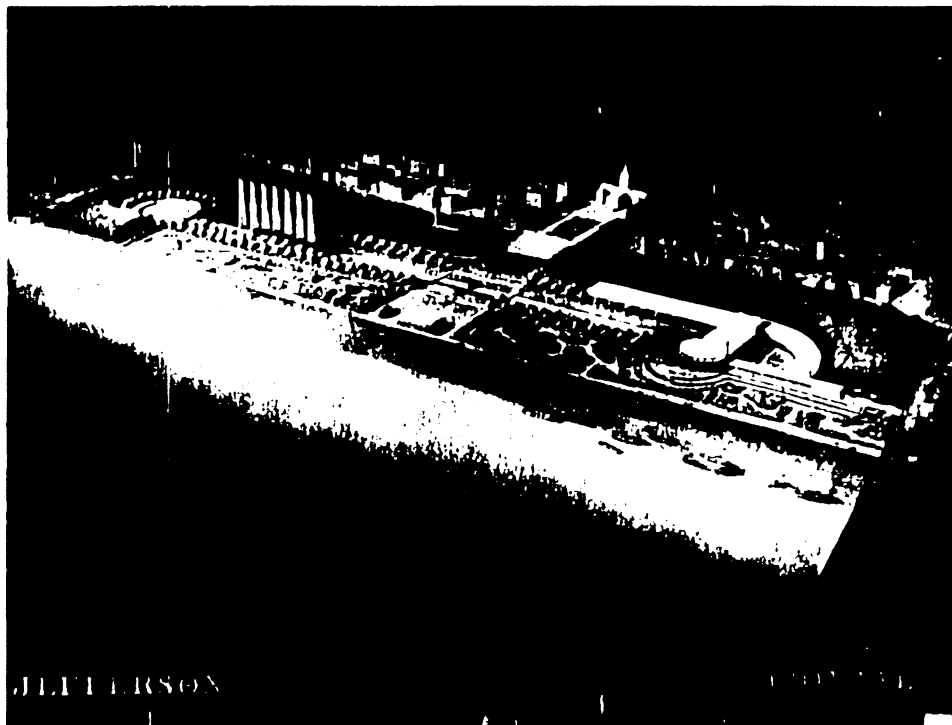


Fig. 36. Gordon A. Phillips. Second stage, sheet B.
SOURCE: JNEM.

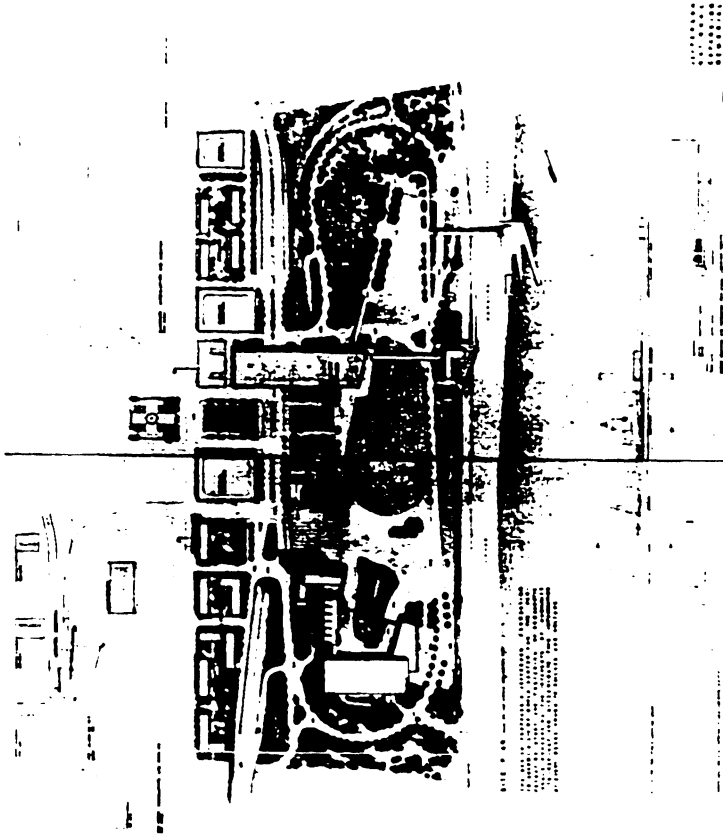


Fig. 37. T. Marshall Rainey. First stage, sheet A.
SOURCE: JNEM.

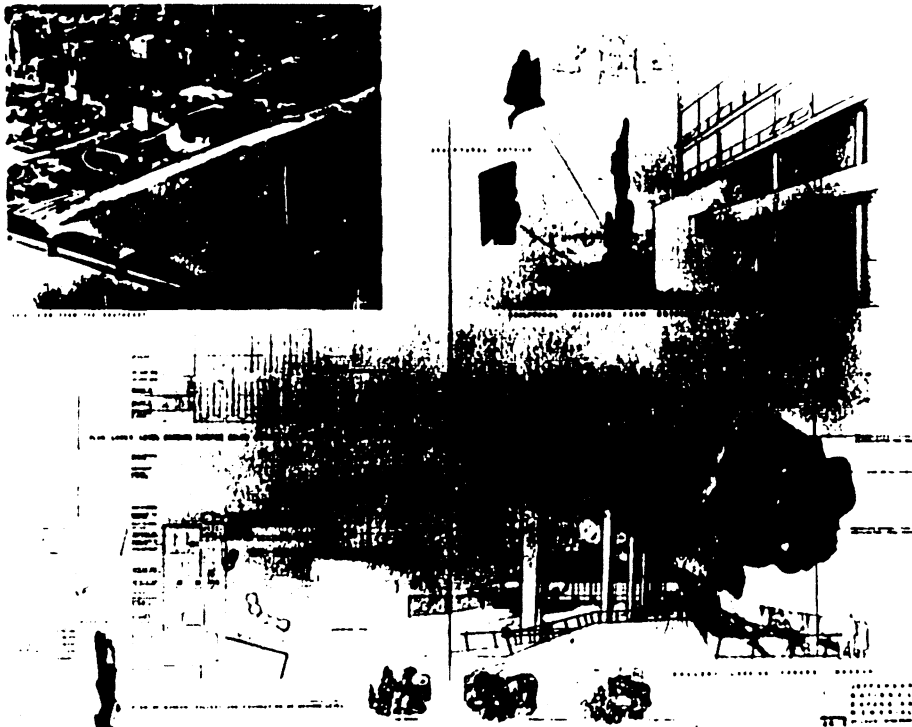


Fig. 38. T. Marshall Rainey. First stage, sheet B.
SOURCE: JNEM.

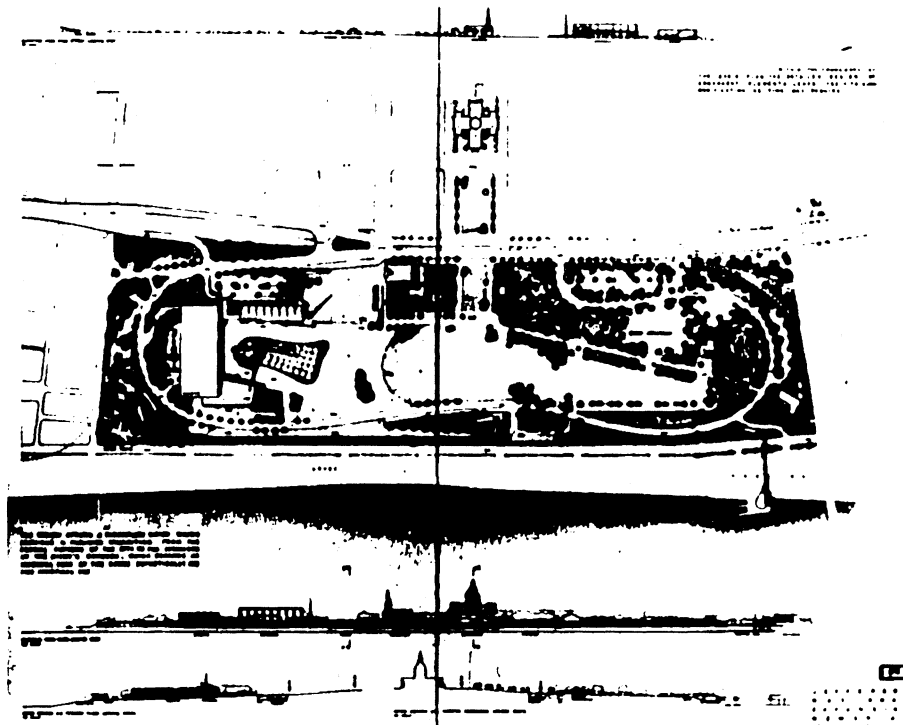


Fig. 39. T. Marshall Rainey. Second stage, sheet A.
SOURCE: JNEM.

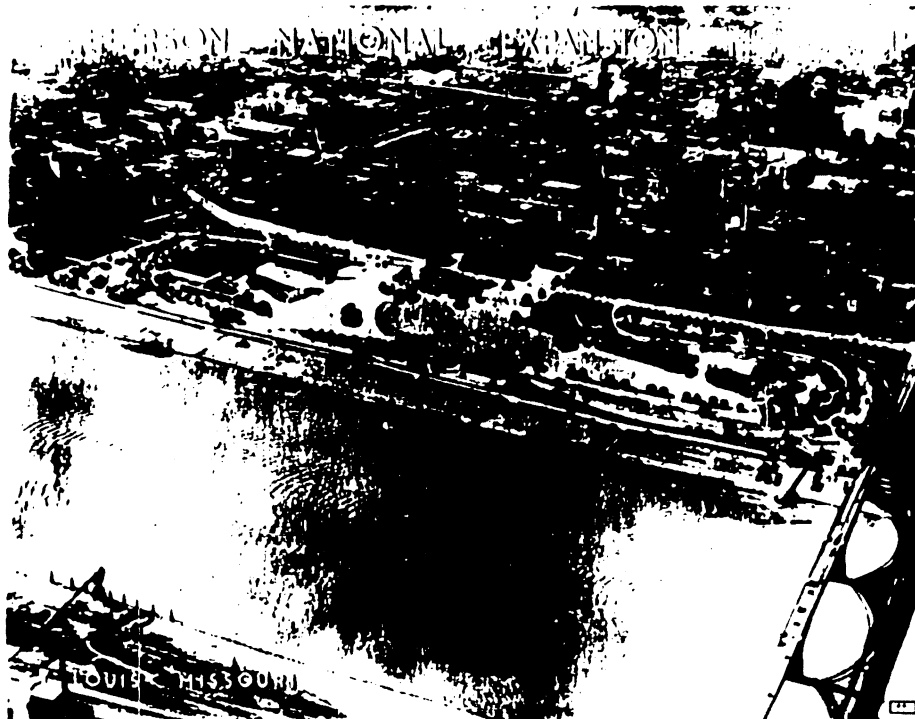


Fig. 40. T. Marshall Rainey. Second stage, sheet B.
SOURCE: JNEM.

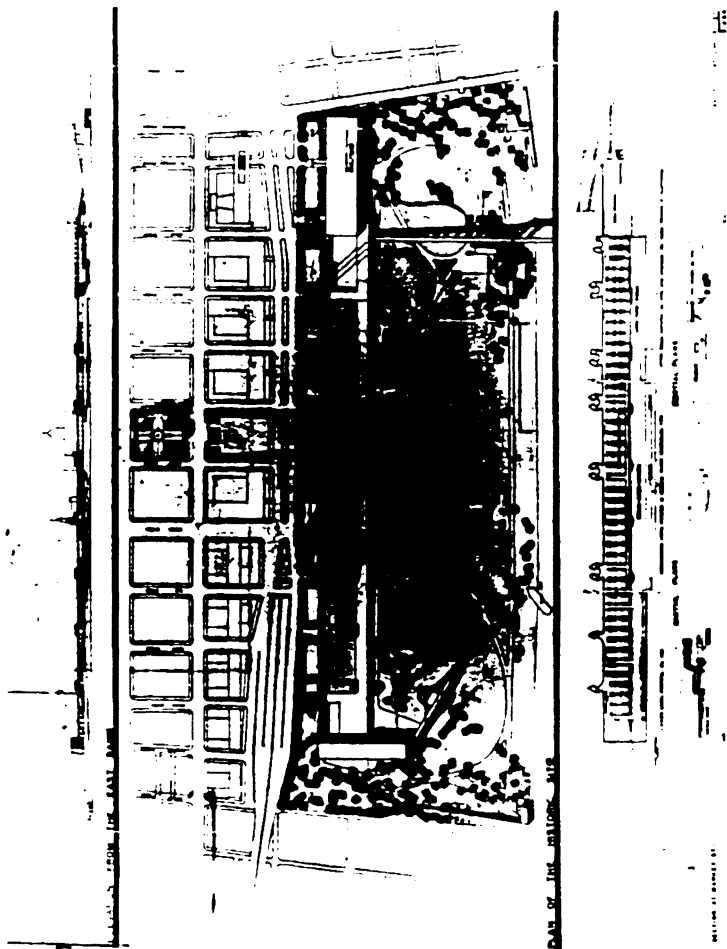


Fig. 41. Breger, Hornbostel and Lewis. First stage, sheet A.
SOURCE: JNEM.



Fig. 42 Breger, Hornbostel and Lewis. First stage, sheet B.
SOURCE: JNEM.

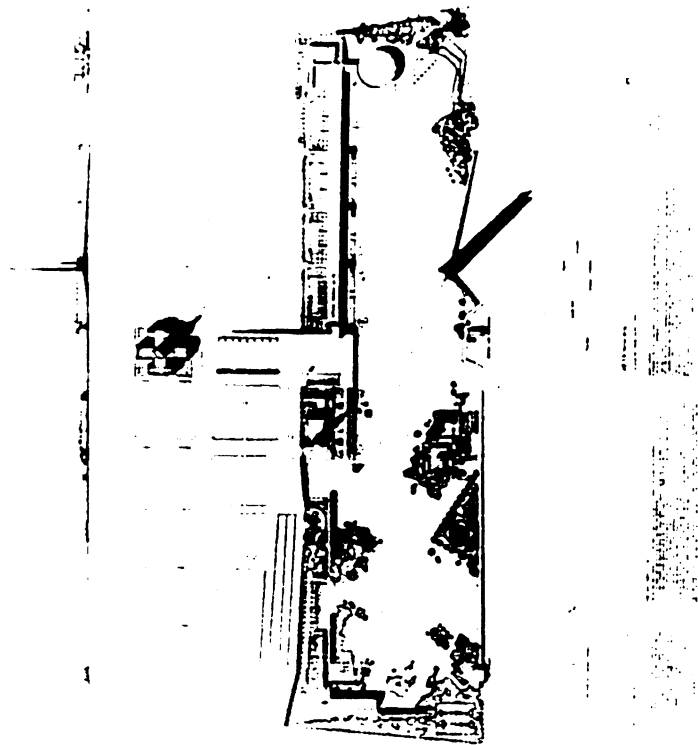


Fig. 43. Breger, Hombostel and Lewis. Second stage, sheet A.
SOURCE: JNEM.

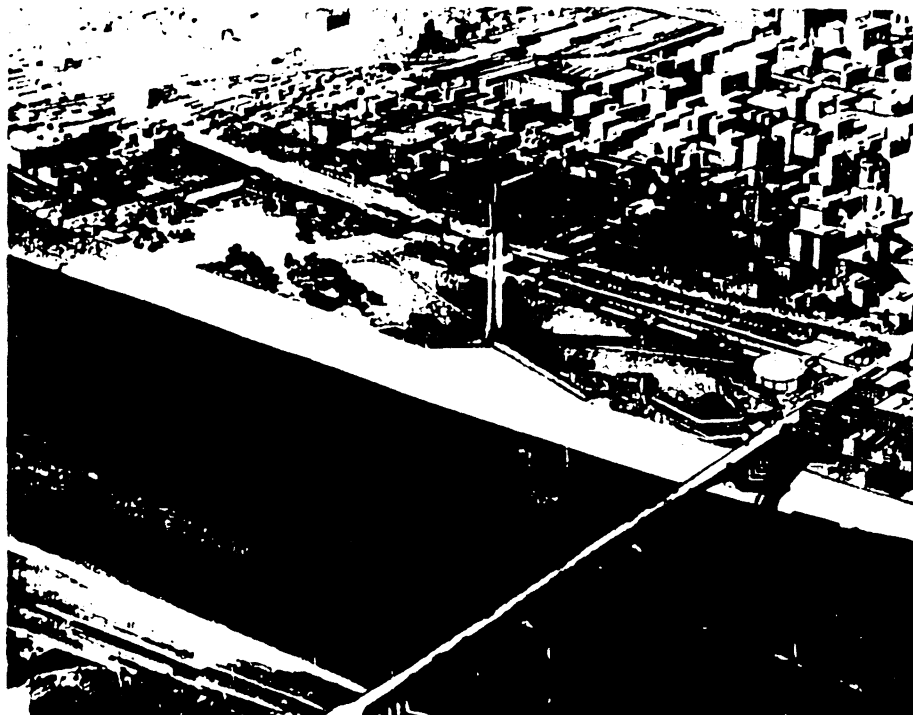


Fig. 44. Breger, Hornbostel and Lewis. Second stage, sheet B.
SOURCE: JNEM.

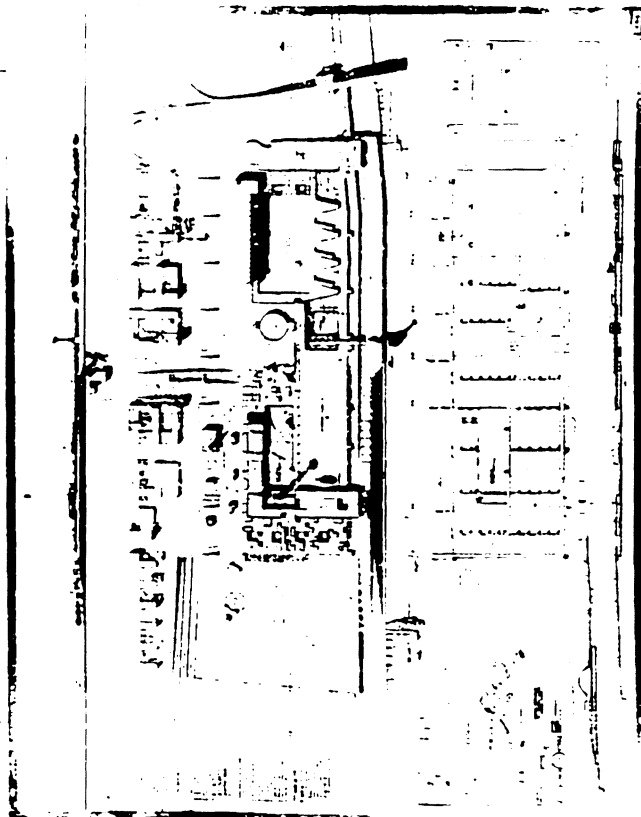


Fig. 45. Percival Goodman. First stage, sheet A.
SOURCE: JNEM.



Fig. 46. Percival Goodman. First stage, sheet B.
SOURCE: JNEM.

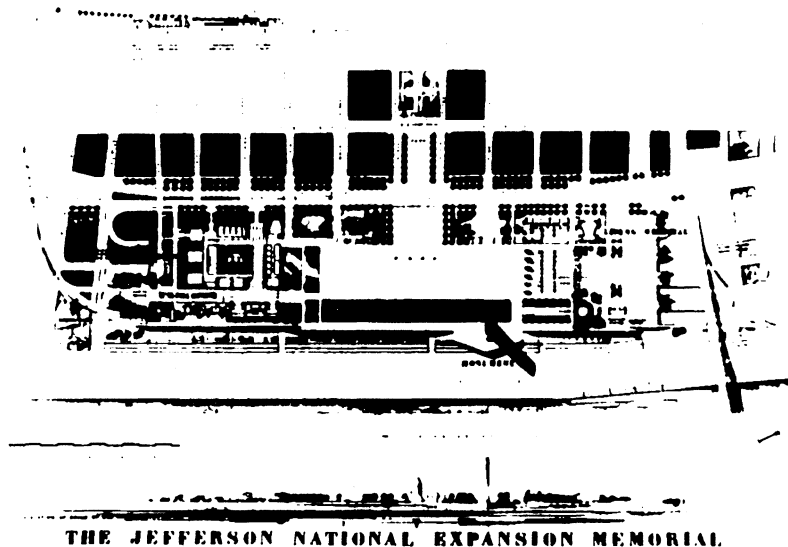


Fig. 47. Pilafian and Montana. First stage, sheet A.
SOURCE: JNEM.



THE JEFFERSON NATIONAL EXPANSION MEMORIAL

Fig. 48. Pilafian and Montana. First stage, sheet B.
SOURCE: JNEM.

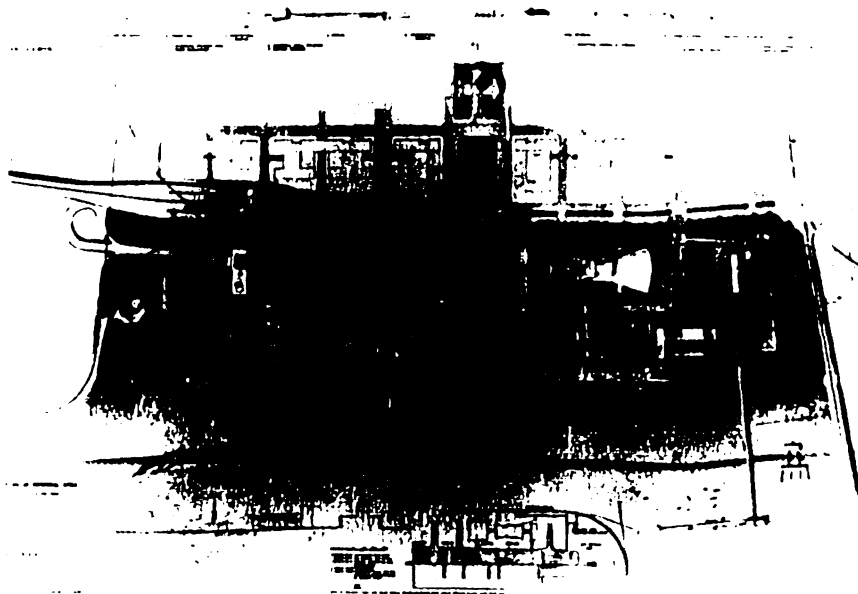


Fig. 49. Stubbins and Perkins. First stage, sheet A.
SOURCE: JNEM.



Fig. 50. Stubbins and Perkins. First stage, sheet B.
SOURCE: JNEM.

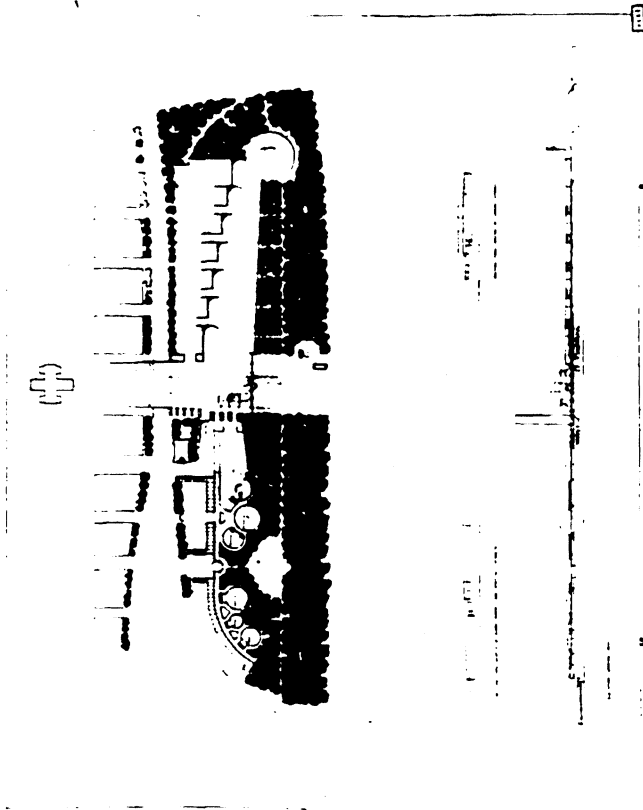


Fig. 51. Eilii Saarinen. First stage, sheet A.
SOURCE: JNEM.

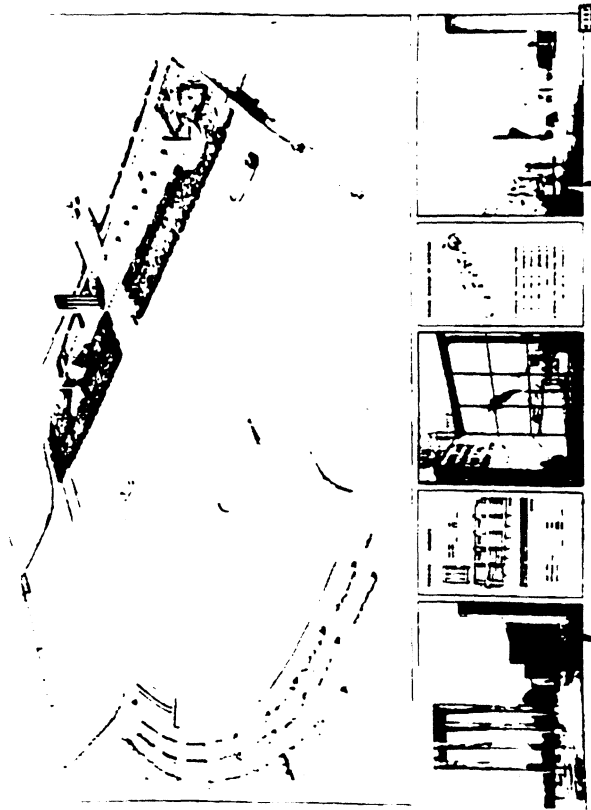


Fig. 52. Ellet Saarinen. First stage, sheet B.
SOURCE: JNEM.

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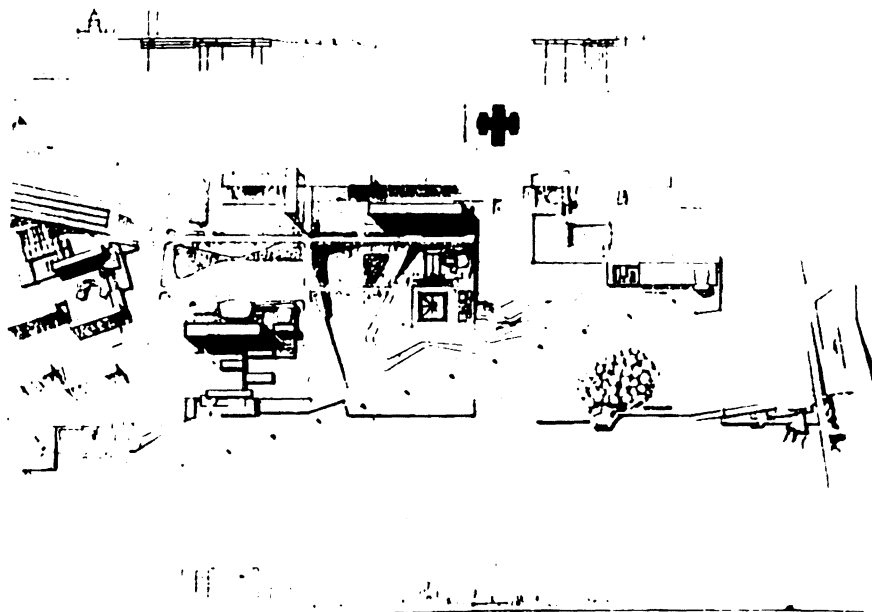


Fig. 53. Charles Eames. First stage, sheet A.
SOURCE: JNEM.

[illegible]

Fig. 54. Charles Eames. First stage, sheet B.
SOURCE: JNEM.

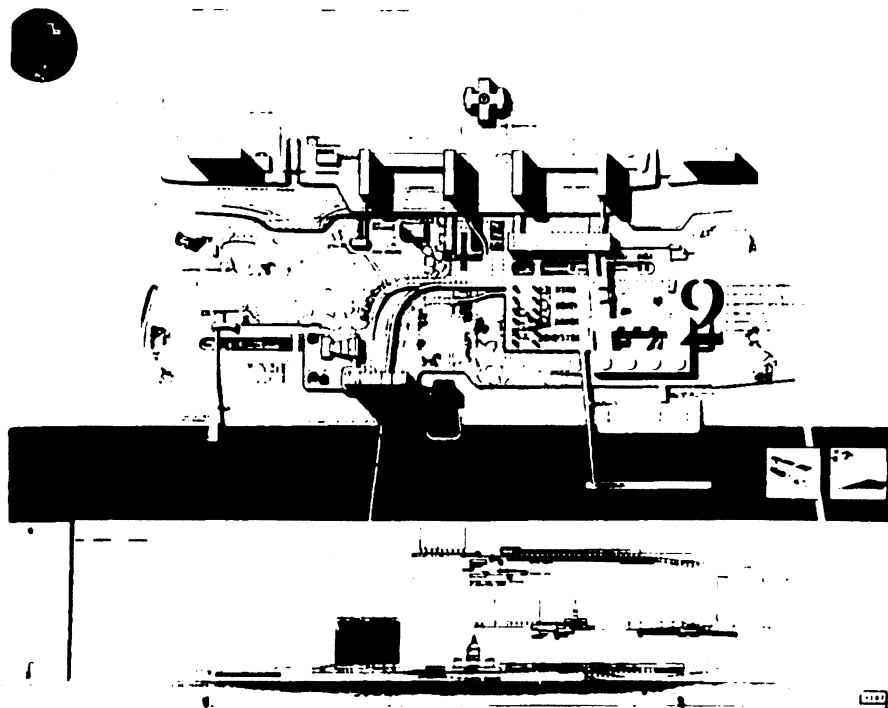


Fig. 55. The Architects Collaborative. First stage, sheet A.
SOURCE: JNEM.

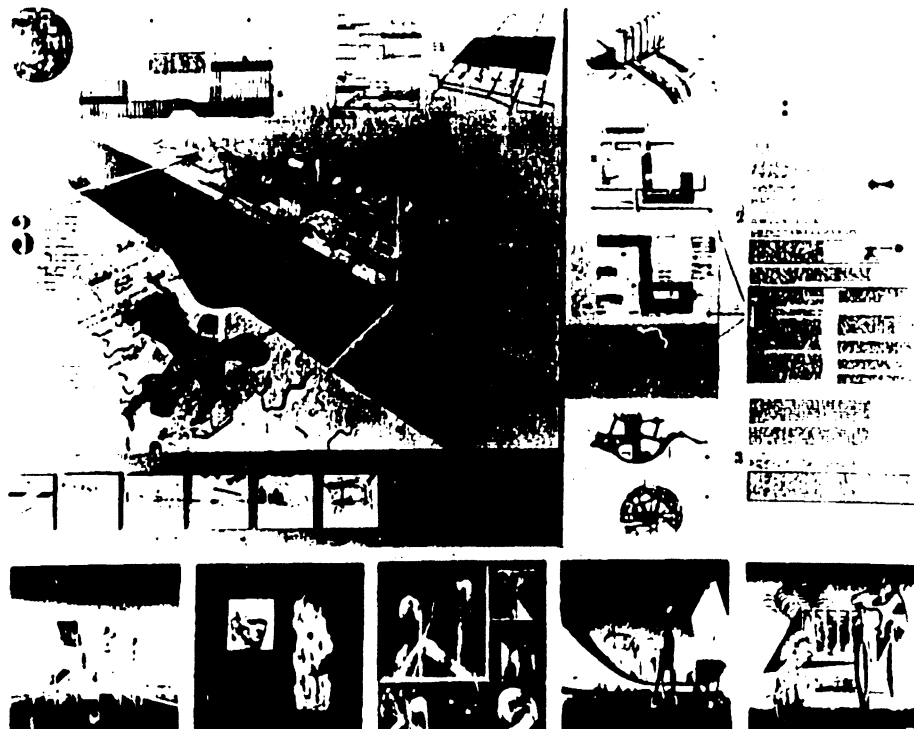


Fig. 56. The Architects Collaborative. First stage, sheet B.
SOURCE: JNEM.

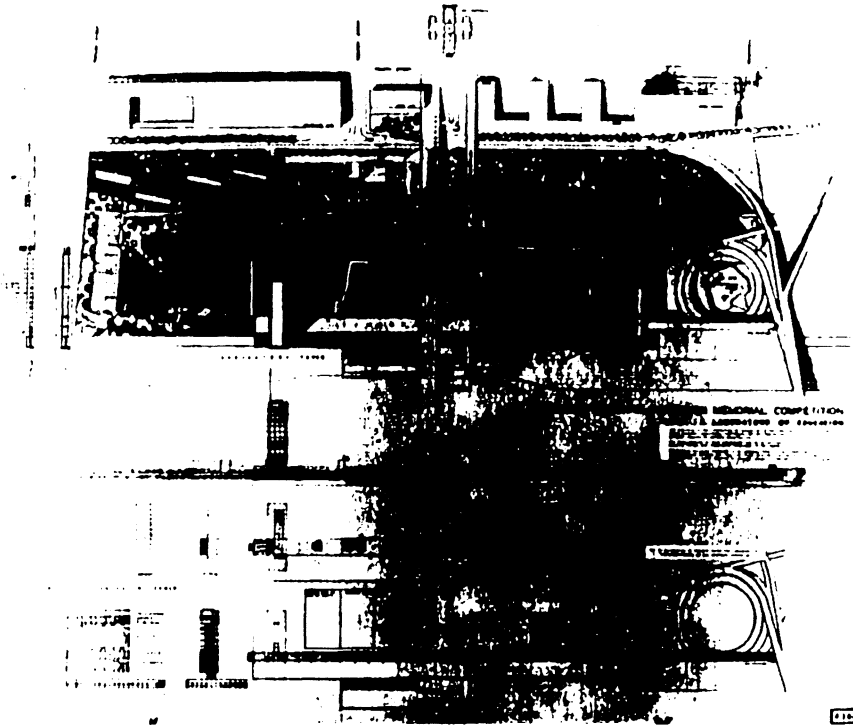


Fig. 57. Louis I. Kahn. First stage, sheet A.
SOURCE: JNEM.

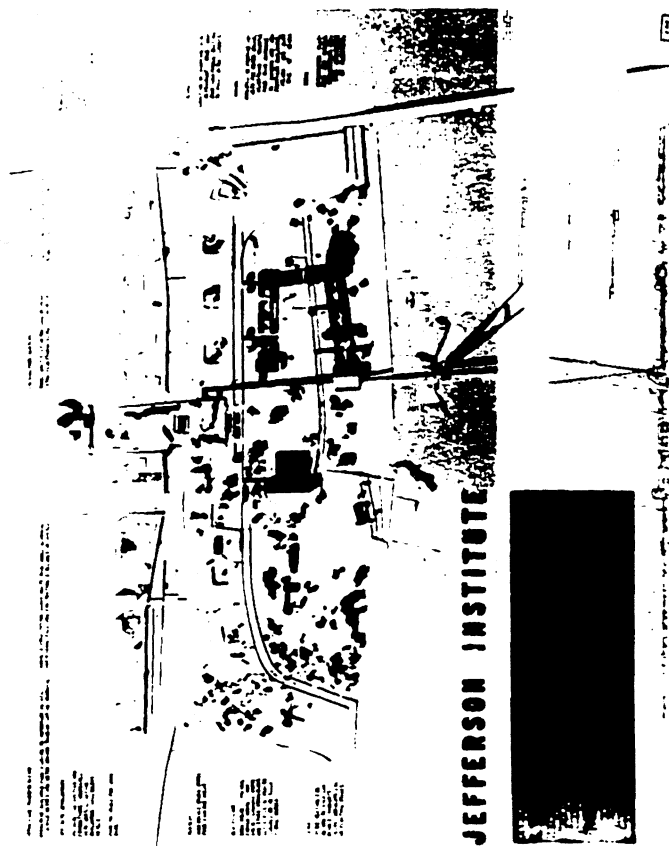
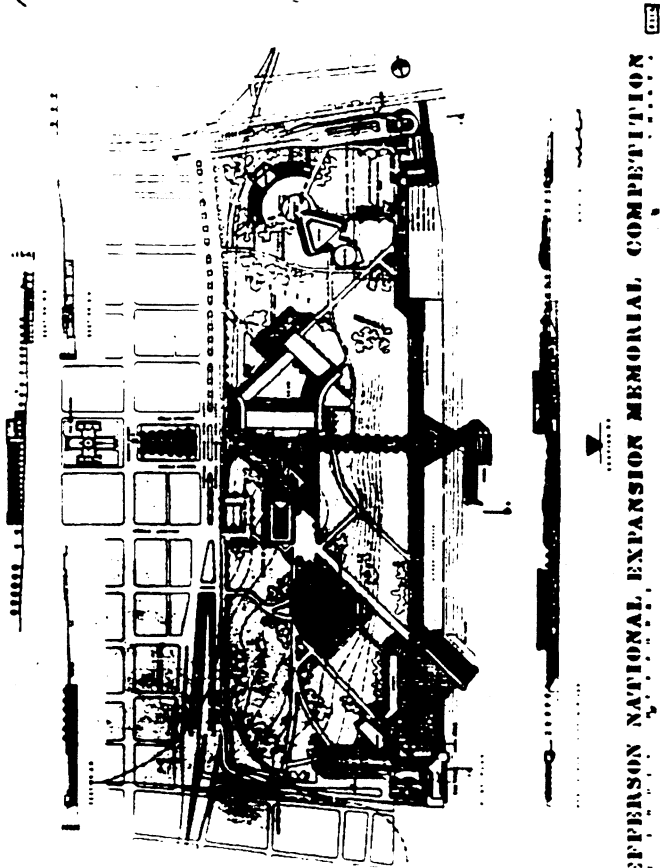


Fig. 59. Tech Associates. First stage, sheet A.
SOURCE: JNEM.



Fig. 60. Tech. Associates. First stage, sheet B.
SOURCE: INEM.



JEFFERSON NATIONAL EXPANSION MEMORIAL COMPETITION

Fig. 61. Skidmore, Owings, and Merrill. First stage, sheet A.
SOURCE: JNEM.

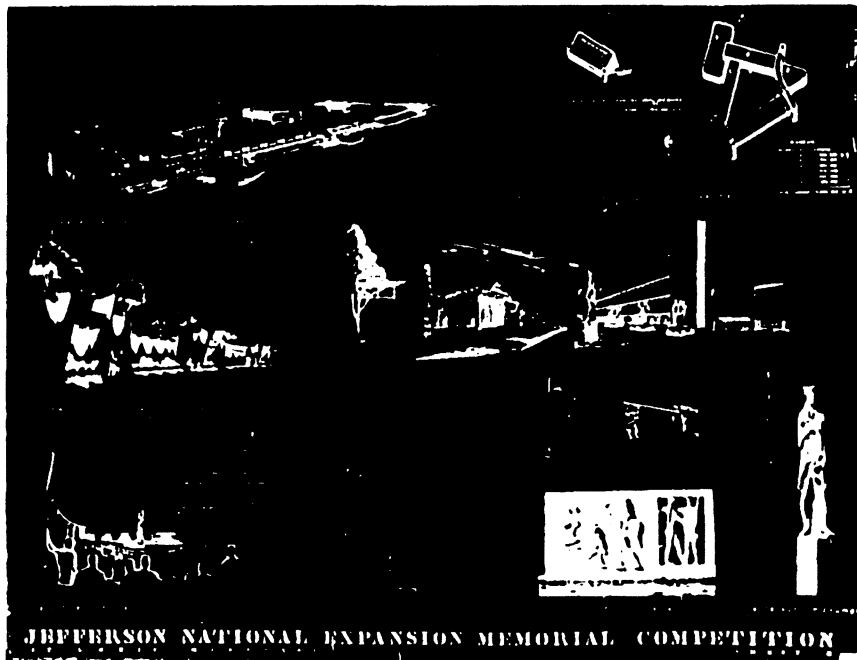


Fig. 62. Skidmore, Owings, and Merrill. First stage, sheet B.
SOURCE: JNEM.

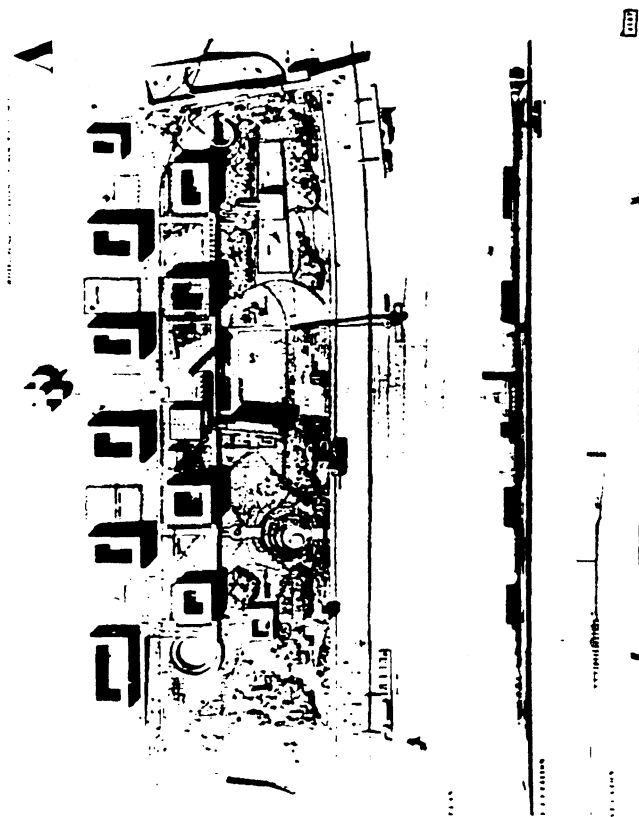


Fig. 63. Harry and John Weese. First stage, sheet A.
SOURCE: JNEM.

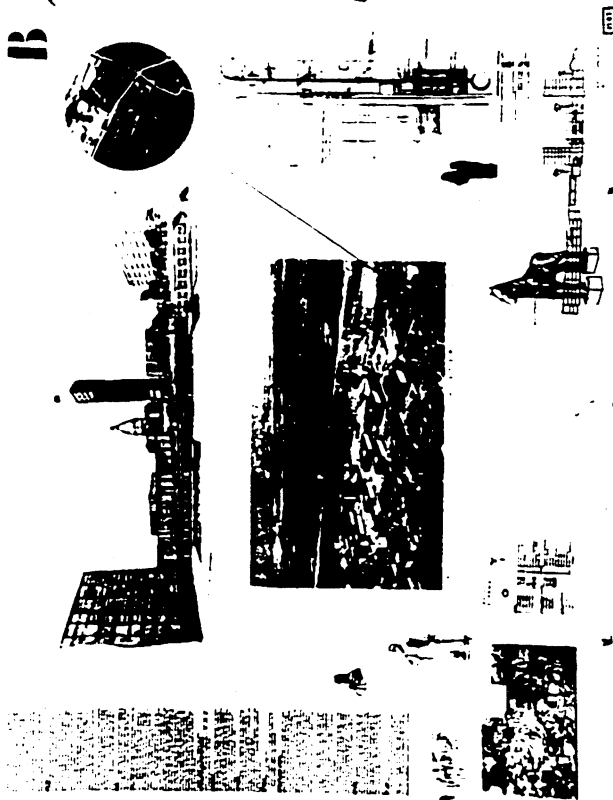


Fig. 64. Harry and John Weese. First stage, sheet B.
SOURCE: JNEM.

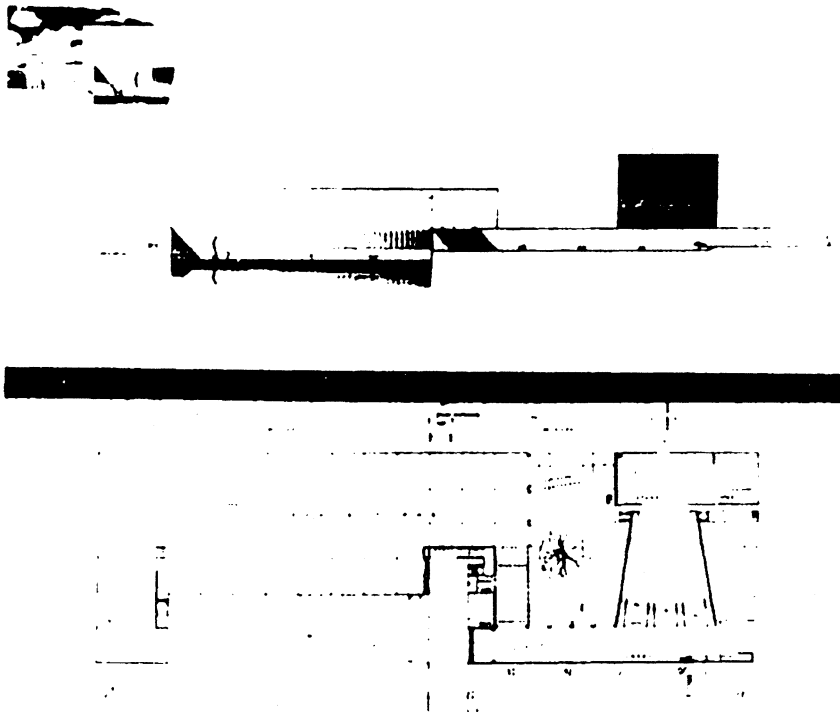


Fig. 65. Eliel and Eero Saarinen. Smithsonian Art Gallery.
SOURCE: Albert Christ-Janer, Eliel Saarinen (Chicago: Chicago University Press, 1948).

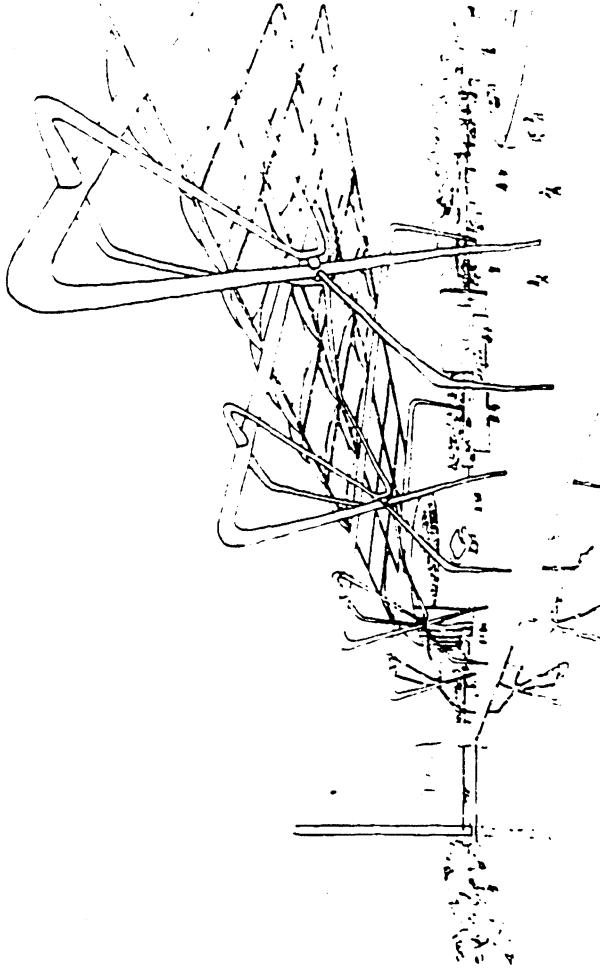


Fig. 66. Louis I. Kahn. Monumentality.
SOURCE: Paul Zucker, ed., New Architecture and City Planning (New York: Philosophical Library, 1944), p. 582.

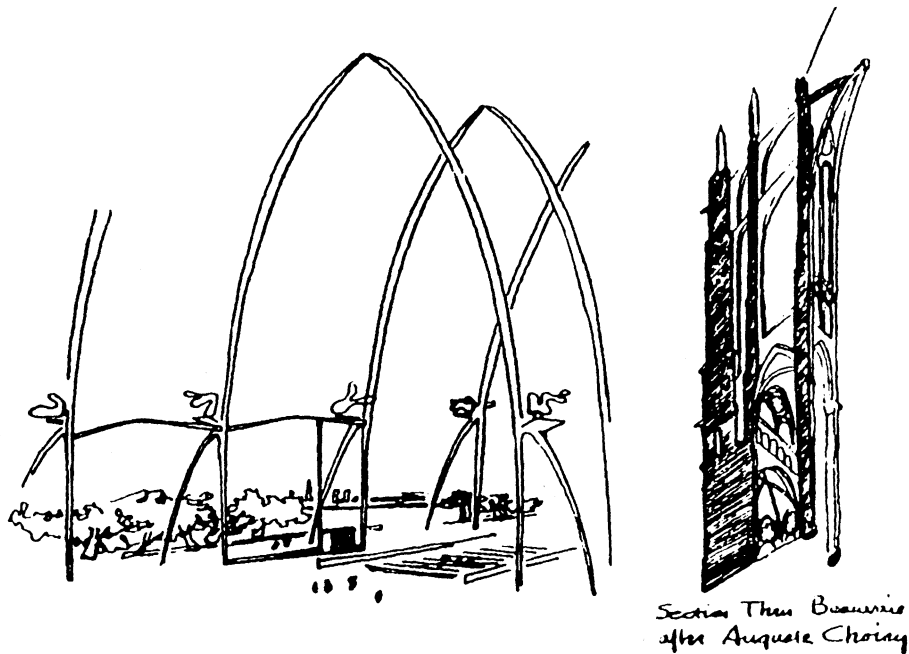


Fig. 67. Louis I. Kahn. Monumentality.
 SOURCE: Paul Zucker, ed., New Architecture and City Planning (New York: Philosophical Library,
 1944), p. 584.

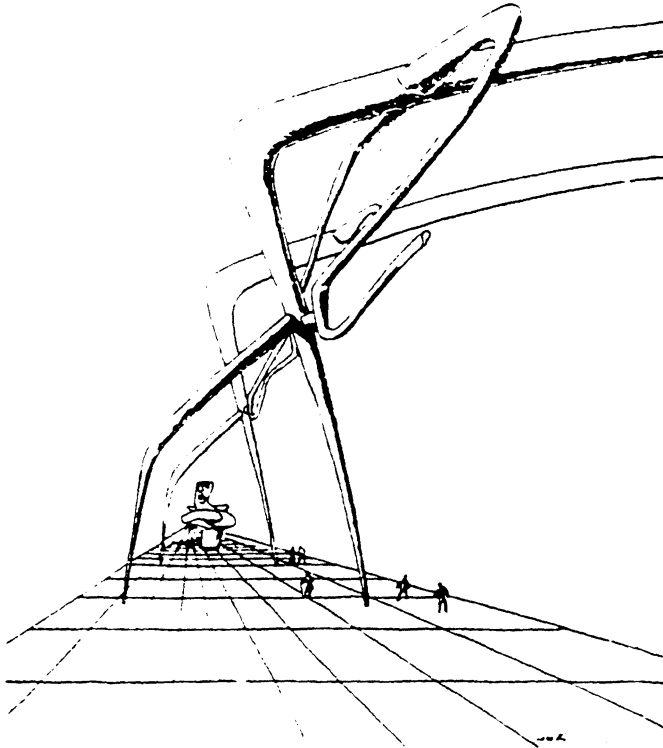


Fig. 68. Louis I. Kahn. Monumentality.
SOURCE: Paul Zucker, ed., New Architecture and City Planning (New York: Philosophical Library, 1944), p. 588.



Fig. 69. Eel Saarinen. Berkshire Music Center, Opera House, Tanglewood, Massachusetts, designed in 1944.
SOURCE: Albert Christ-Janer, Eel Saarinen (Chicago: University of Chicago Press, 1948), p. 151. Photo by
Gottscho Schleisner.



Fig. 70. Eliel Saarinen. Berkshire Music Center, Opera House, Tanglewood, Massachusetts, designed in 1944.
SOURCE: *Ibid.*, p. 103, fig. 143.

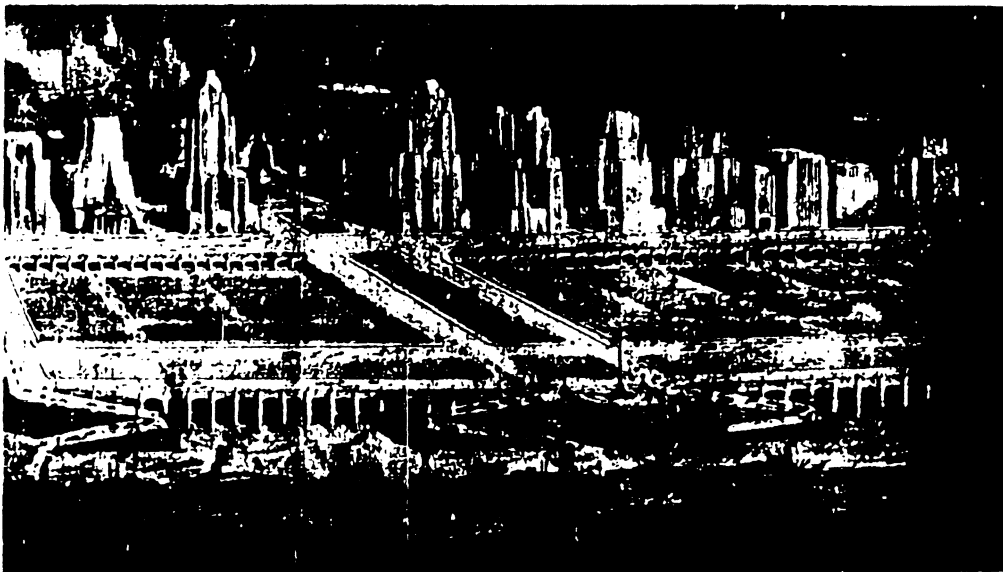


Fig. 71. : A Plan for the Central River Front, the City Plan Commission, St. Louis, drawn by Hugh Ferriss, 1928.
SOURCE: Harland Bartholomew, "A Plan for the Central River Front" In A Plan for the Central River Front,
City Plan Commission, Harland Bartholomew, Engineer, 1928. JNEM.



Fig. 72. A Plan for the Central River Front, the City Plan Commission, St. Louis, model made by Victor Berlendis, 1928.

SOURCE: Harland Bartholomew, "A Plan for the Central River Front" In A Plan for the Central River Front, City Plan Commission, Harland Bartholomew, Engineer, 1928. JNEM.

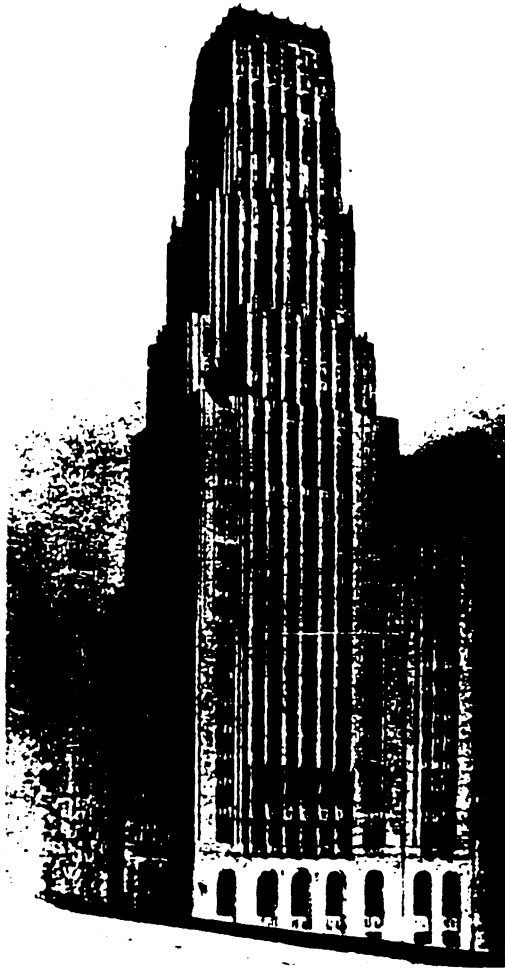


Fig. 73. Eliel Saarinen. Perspective,
Chicago Tribune competition, second
prize, 1922.

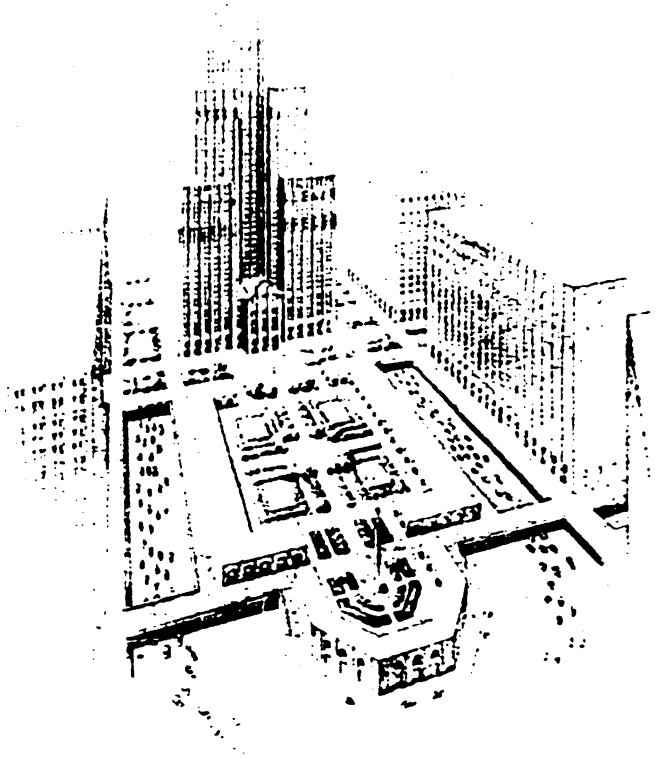


Fig. 74. Eliel Saarinen. Lake Front Project of the City of Chicago. Aerial view, hotel plaza with underground railroad station, 1923.

SOURCE: Christ-Janer, p. 65, fig. 77.



Fig. 75. Hugh Ferriss. New York zoning envelope, 1922.

SOURCE: Hugh Ferriss, The Metropolis of Tomorrow (Princeton: Princeton Architectural Press, 1986), p. 79.

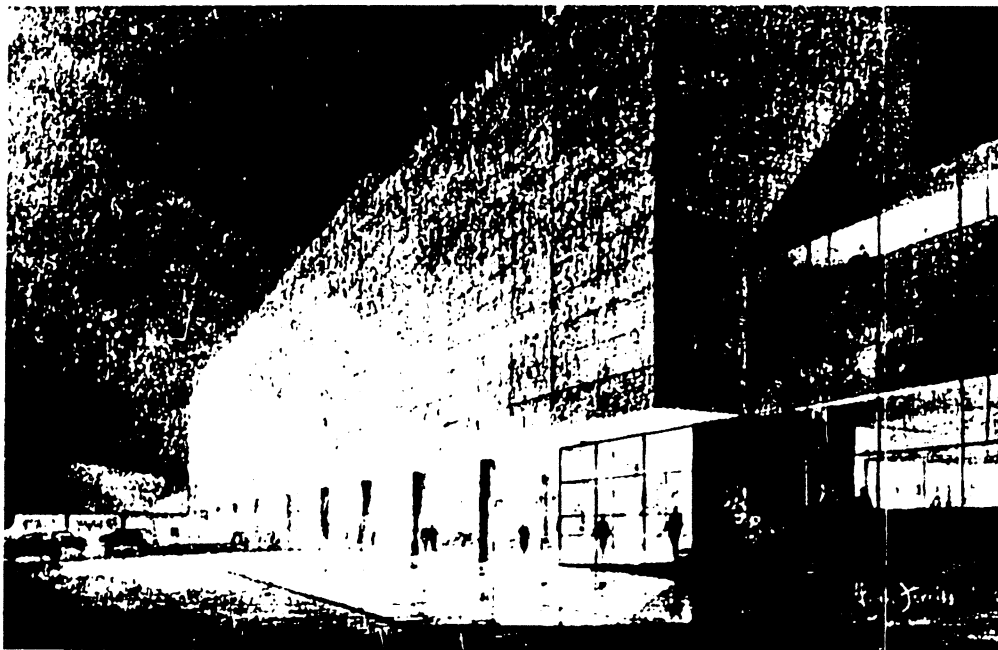


Fig. 76. Hugh Ferriss. General Motors Technical Center. Administration Building, main entrance, 1945.
SOURCE: Christ-Janer, p. 128, fig. 178.

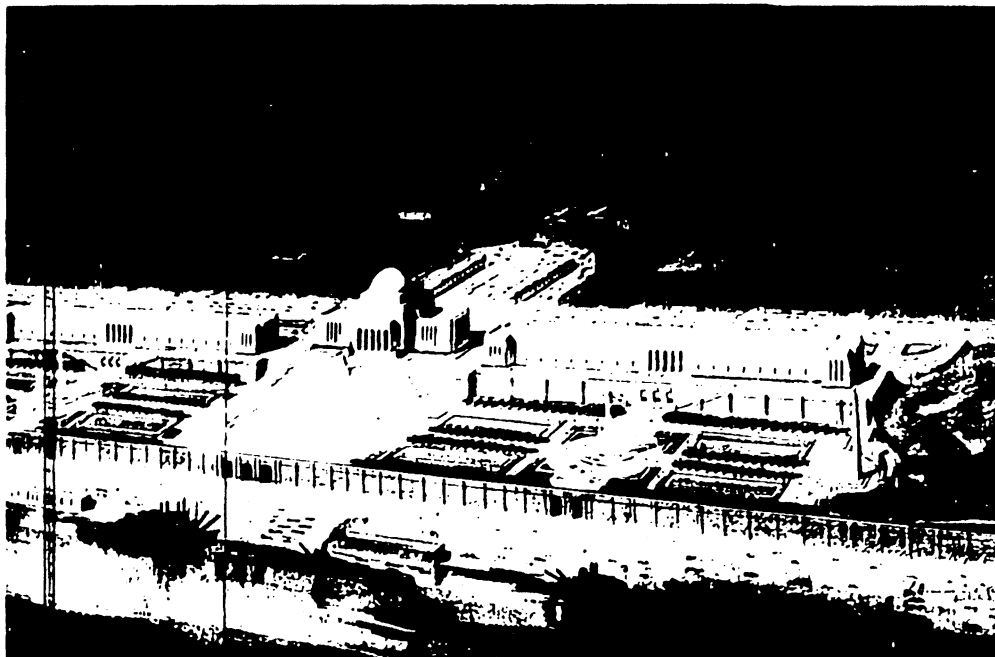


Fig. 77. LaBeaume and Klein. Plan for the United States Territorial Expansion Memorial Commission and the Jefferson National Expansion Memorial Association, 1935.

SOURCE: "Thomas Jefferson and the Pioneers to Whom We Owe Our National Expansion," presented in Some Aspects of the Planning of the Jefferson National Expansion Memorial, prepared by Daniel Cox Fahey, Jr., February, 1937, Revised July 1937 and October 1937., plate XVIII. JNEM.



Fig. 78. Jackson Shotwell Armstrong: 1944 proposal. Project plan, superimposed on airview.

SOURCE: Architectural Forum, April 1944, p. 113.

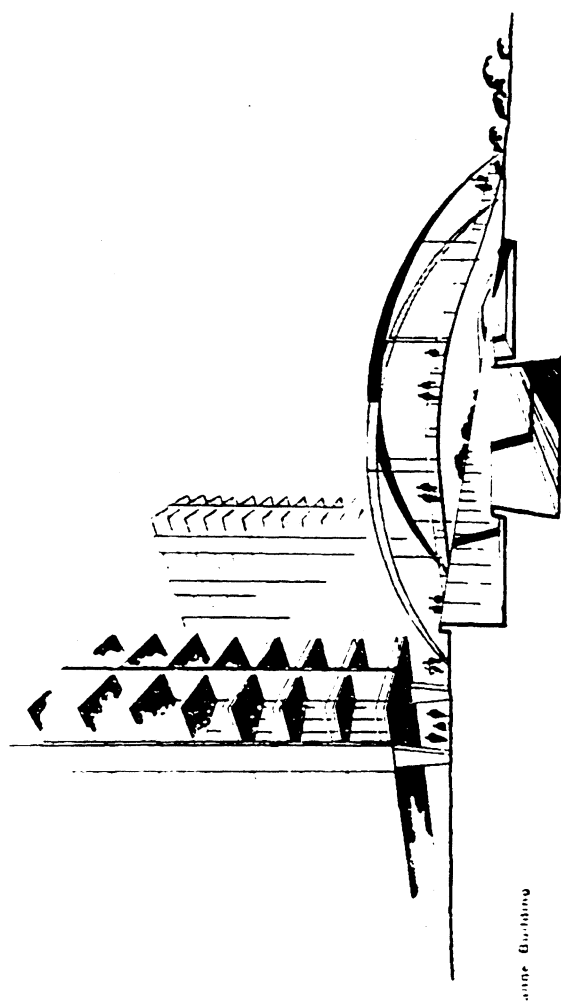


Fig. 79. Jackson Shotwell Armstrong, 1944 proposal.
SOURCE: Architectural Forum, April 1944, p. 115.

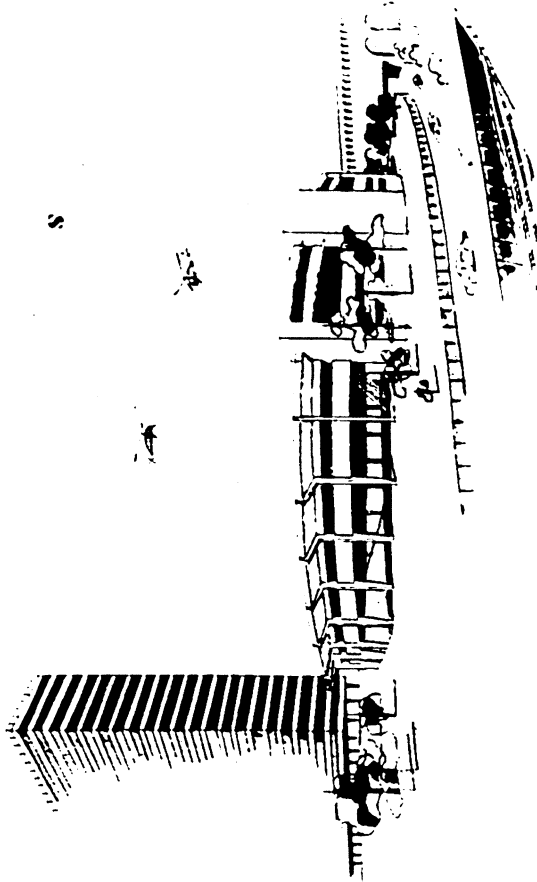


Fig. 80. Jackson Shotwell Armstrong, 1944 proposal.
SOURCE: *Architectural Forum*, April 1944, p. 116.

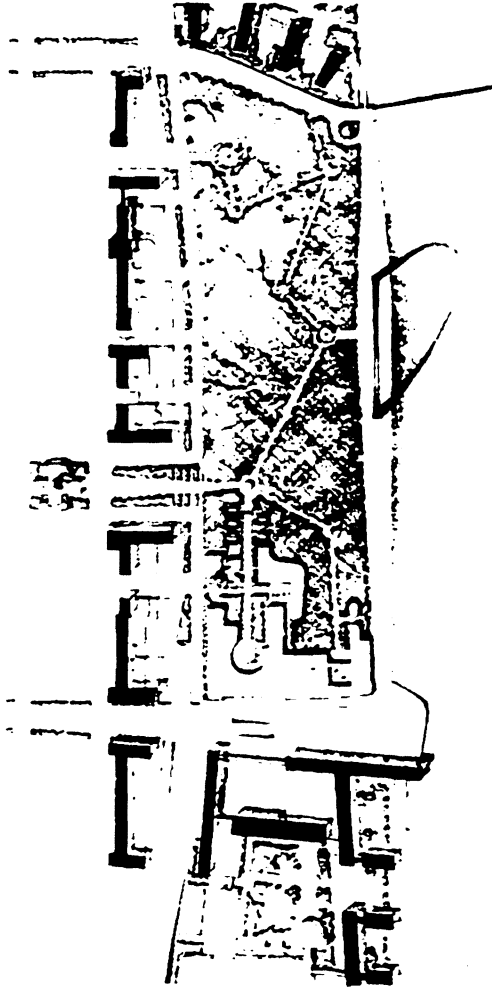


Fig. 81. Eero Saarinen. Drawing no. 1: Sketch site plan, first stage.
SOURCE: Progressive Architecture, May 1948, p. 57, fig. B.

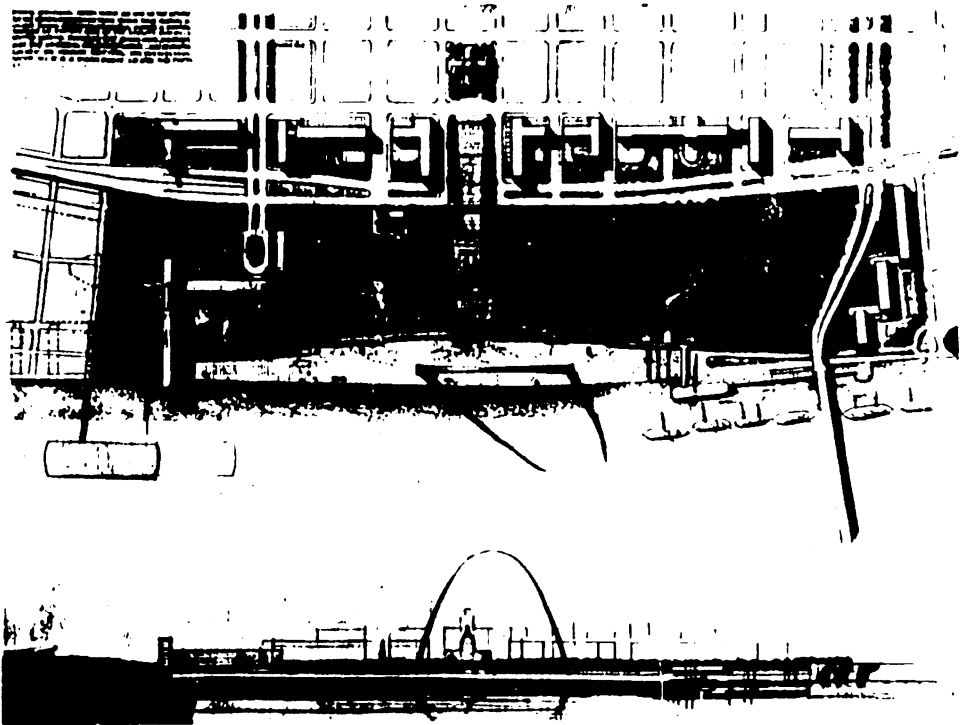


Fig. 82. Eero Saarinen. Drawing no. 2: Site plan and elevation, preparatory drawing for first-stage submission.
SOURCE: Eero Saarinen Archive, Kevin Roche John Dinkeloo and Associates, Hamden, CT. (KR hereafter).

I haven't really had a chance to draw this up carefully but I think it has real possibilities. It would eliminate any feeling that the tower area is to avoid - It would give us a chance to put trees further out - it would give us a chance to place sculpture in a human way and so that people have the patience to look at it. - This has no disadvantages - it does take room but I think we can adjust the whole thing so that the forest part doesn't get too thin.

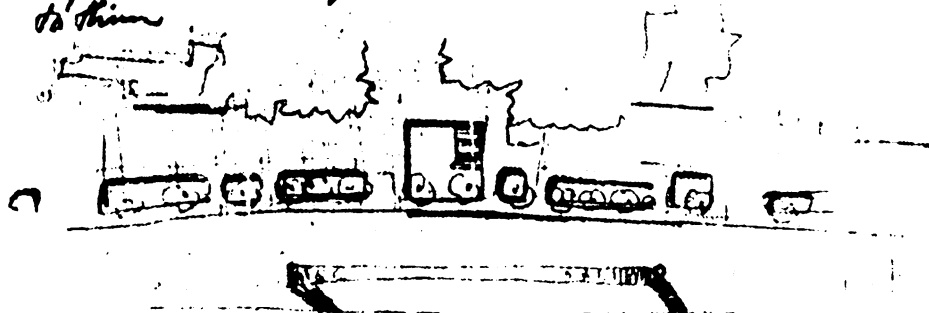


Fig. 83. Eero Saarinen. Drawing no. 3: Freehand sketch of the memorial plaza and gardens with Saarinen's comments, first stage.

SOURCE: Progressive Architecture, May 1948, p. 56, fig. A.

Dear Jey

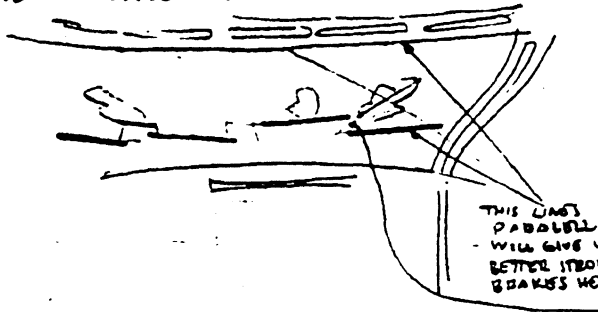
I am sending under separate cover a sketch of it. I worked out here on the roof of commercial buildings west of the thru highway. (all this is on the construction) I hope you like it better - I think what it has accomplished is 1. Smaller scale, 2. More broken up and therefore the UN building will stand out more. 3. they (I think) look like buildings that could have a lot of charm etc etc. - As they were rather the looked like little commercial building blocks. Possibly they are a little too broken up but we can always demand them later.

I've all thought I went on a vacation - actually I have been working on the construction until 2 a.m. every night (last three) I have been working with Dan Kiley getting him so familiar with the whole thing so that when he comes out to work the (18th or 19th) no time will be lost with getting him familiar etc. he will bring with him studies on the garden above the museum. Probably also in larger scale. If Kiley has finished the enlarged of the plan it might be good if you had a hand made and sent it to him as mail.

Fig. 84. Eero Saarinen. Saarinen's letter to J. Henderson Barr, undated, August, 1947.
SOURCE: KR.

ARCHITECTS - BLOOMFIELD HILLS - MI - U.S.A.
 L. SAARINEN & A.S.
 100 EAST 17 AVENUE
 CLEVELAND 17, OHIO
 O.E. PO. BOX 1000
 I don't want to be with while only if it is done
 immediately (that is if the plan is in a shape to
 be suited) otherwise I would let it go.

I have one thought which might be worth when
 on the general shape of the back wall of the
 museum. - It might be a slight as I have
 known it in the past all the lines have
 have been straight (with the T-square) but
 if this wall paralleled the highway it might
 look a little better



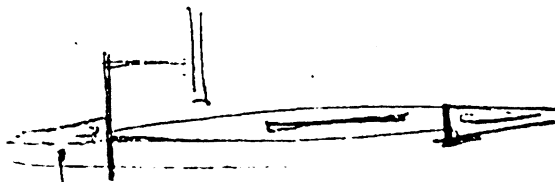
See what I mean —

~~One other thought I had then discussing~~
~~there~~

Showing the project to Dan and other people
 are concerned — How do you get to the
 Place from the parking etc.?

Fig. 85. Eero Saarinen. Drawing no. 4: Freehand sketch in Saarinen's
 letter to J. Henderson Barr, undated, August, 1947.
 SOURCE: KR.

To strengthen us on this point I have shown
 foot bridges across on a few places
 also having a minor drive coming in from
 the South might be advisable



MINOR DRIVE AS WE
 HAD IT EARLIER BUT
 BECAUSE OF OTHER CHANGES
 IT BECAME SMALLER ON THE
 SHEET — I THINK IT IS A GOOD IDEA
 TO ADD IT AGAIN.

Now my only other concern is the
rendering — I will write you
 about that from our next stop
 as we are leaving now for Maine
 So long — Give our love to everybody
 and don't work too hard (but the
 next thing to it.
 ESB

Fig. 86. Eero Saarinen. Drawing no. 5: Freehand sketch in Saarinen's letter to J. Henderson Barr, undated, August, 1947.
 SOURCE: KR.

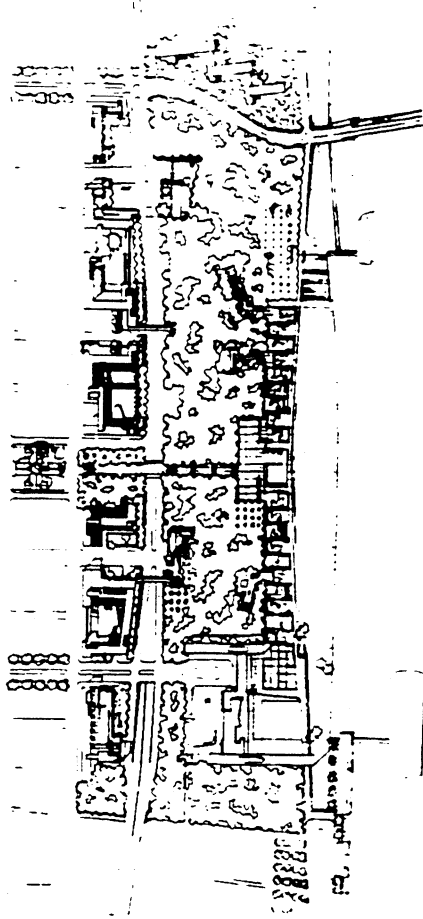


Fig. 87. Eero Saarinen. Drawing no. 6: Line drawing of site plan, used as the underlying sheet for drawing no. 7.
SOURCE: KR.

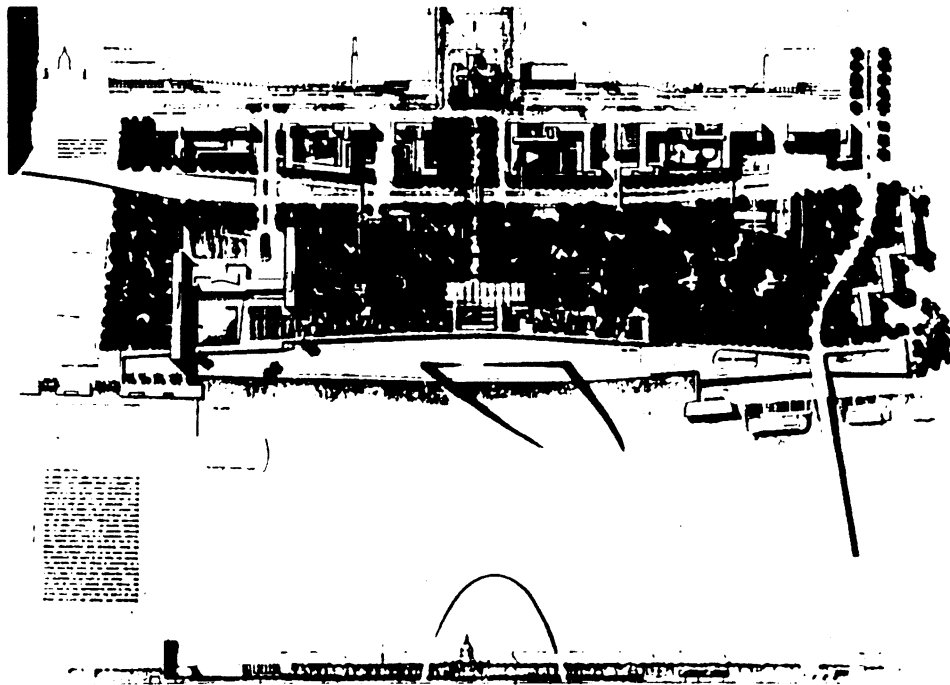


Fig. 88. Eero Saarinen. Drawing no. 7: Original of sheet A, first-stage submission. A photographic reproduction of this drawing was submitted to the competition.
SOURCE: KR.



Fig. 89. Eero Saarinen. Detail, drawing no. 7, depiction of trees.
SOURCE: KR.

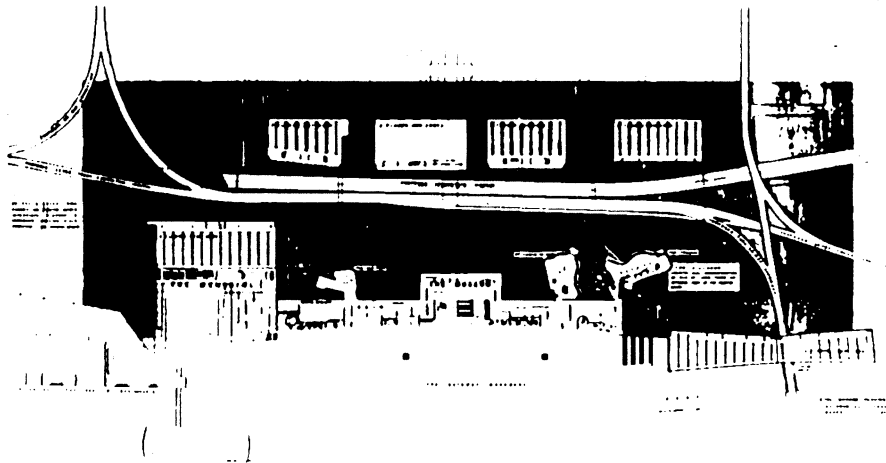


Fig. 90. Eero Saarinen. Drawing no. 8: Basement floor plan, first stage.
SOURCE: KR.



Fig. 91. Eero Saarinen. Detail, drawing no. 9 (sheet B, first stage submission).
SOURCE: JNEM.



Fig. 92. Eero Saarinen. Drawing no. 10: Original outline drawing to become a part of drawing no. 9.
SOURCE: KR.



Fig. 93. Eero Saarinen. Drawing no. 11: Site plan with the low-rise museum and the Old Rock House, second stage.

SOURCE: Progressive Architecture, May 1948, p. 57, fig. C.

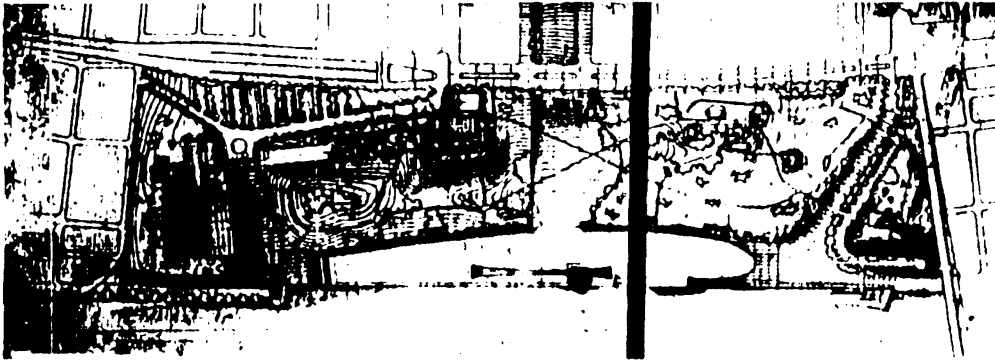


Fig. 94. Eero Saarinen. Drawing no. 12: Line drawing of site plan, almost the same design as the second-stage submission except the museum design.
SOURCE: KR.

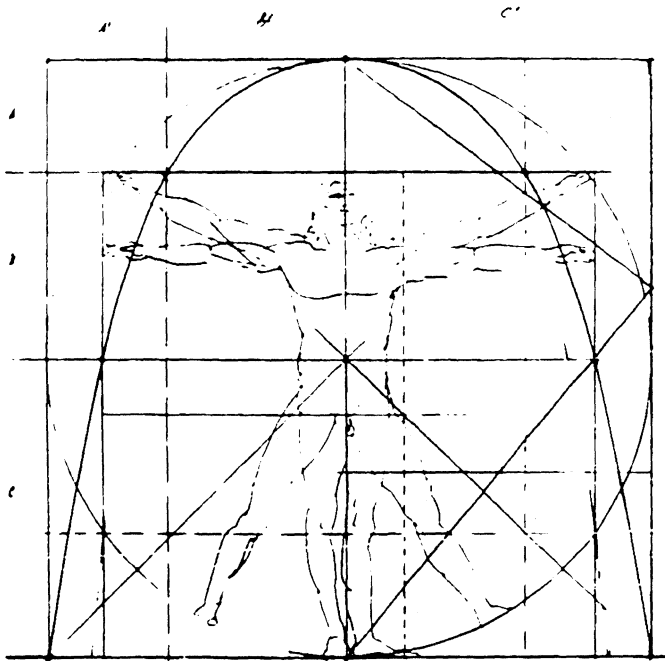


Fig. 95. Eero Saarinen. Study of proportion, after the competition.
SOURCE: KR.

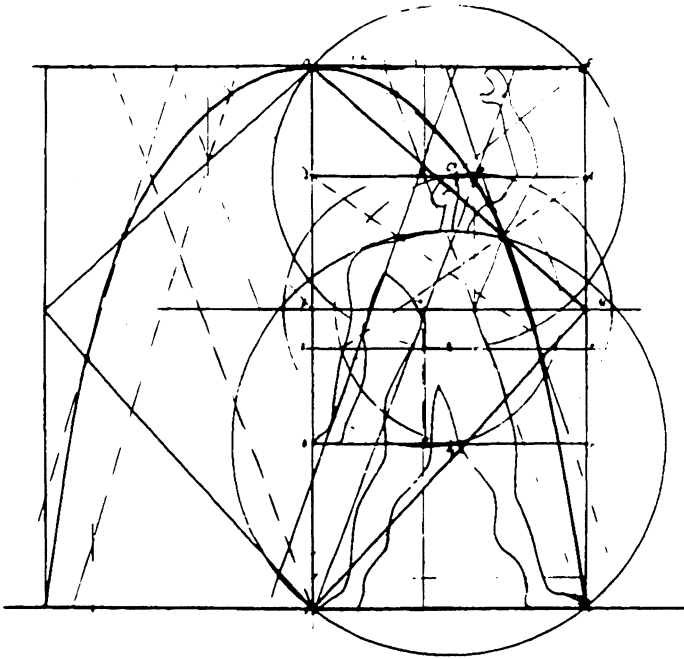


Fig. 96. Eero Saarinen. Study of proportion, after the competition.
SOURCE: KR.

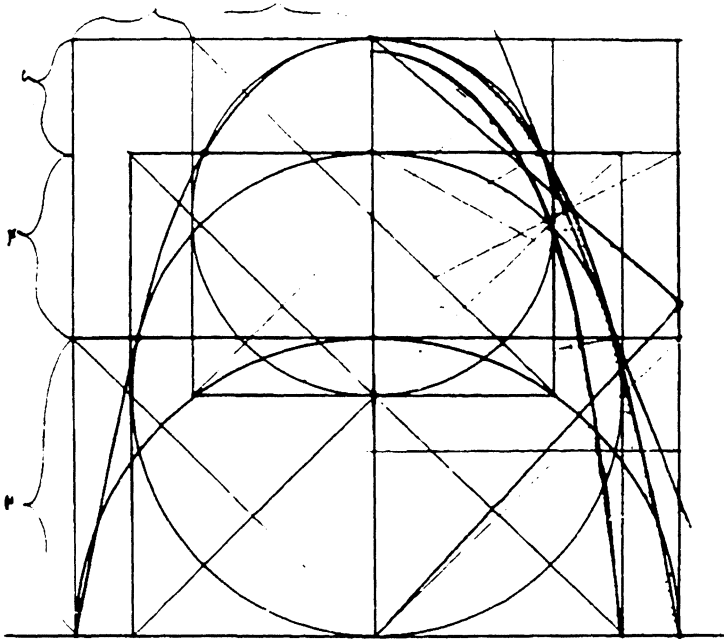


Fig. 97. Eero Saarinen. Study of proportion, after the competition.
SOURCE: KR.

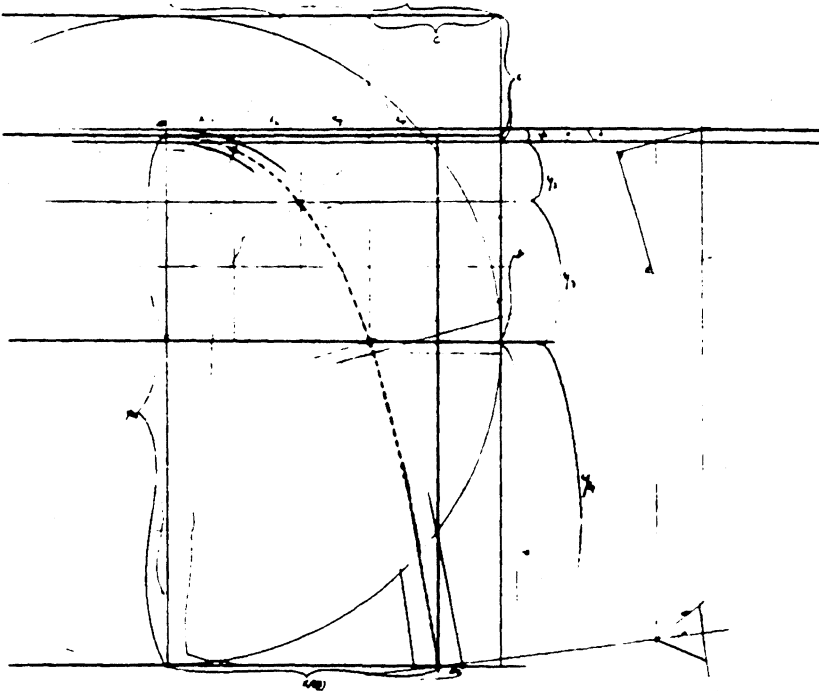


Fig. 98. Eero Saarinen. Study of porportion, after the competition.
SOURCE: KR.

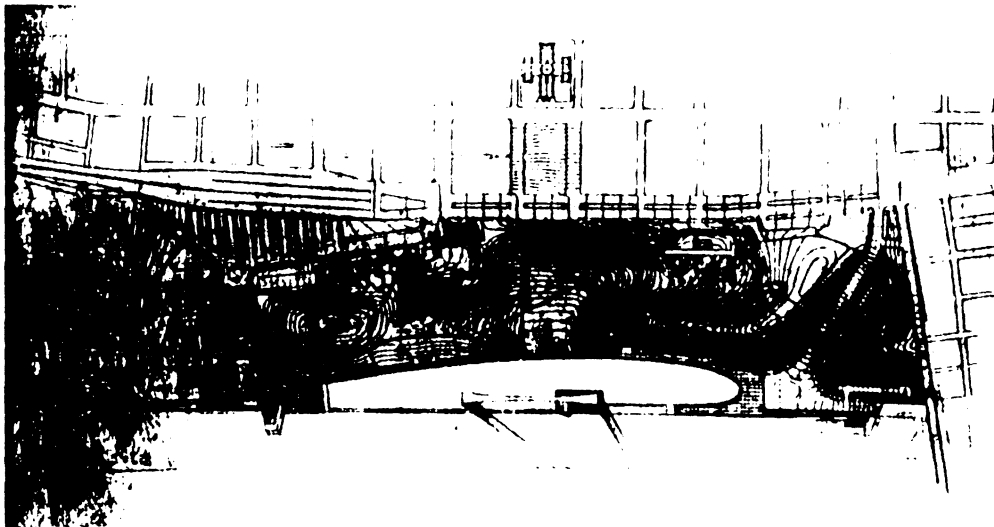


Fig. 99. Eero Saarinen. Drawing no. 13: Line drawing of site plan, without trees.
SOURCE: KR.

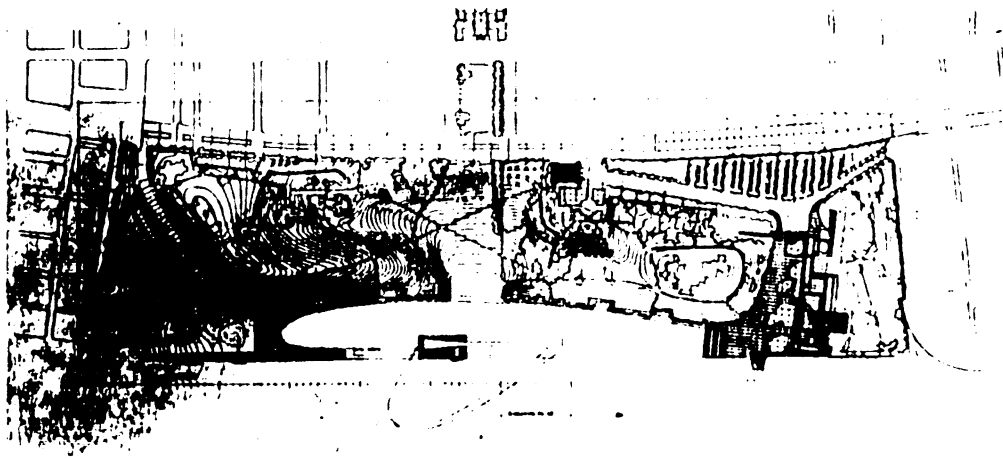


Fig. 100. Eero Saarinen. Drawing no. 14: Line drawing of site plan, with trees, used as the underlying sheet for the second-stage submission (drawing no. 15).
SOURCE: KR.

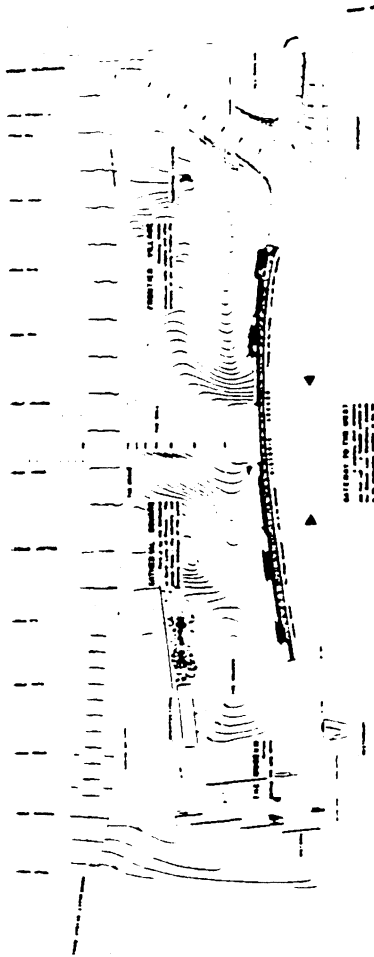


Fig. 101. Eero Saarinen. Drawing no. 16: Overlay which accompanied second-stage submission sheet A.
SOURCE: KR.

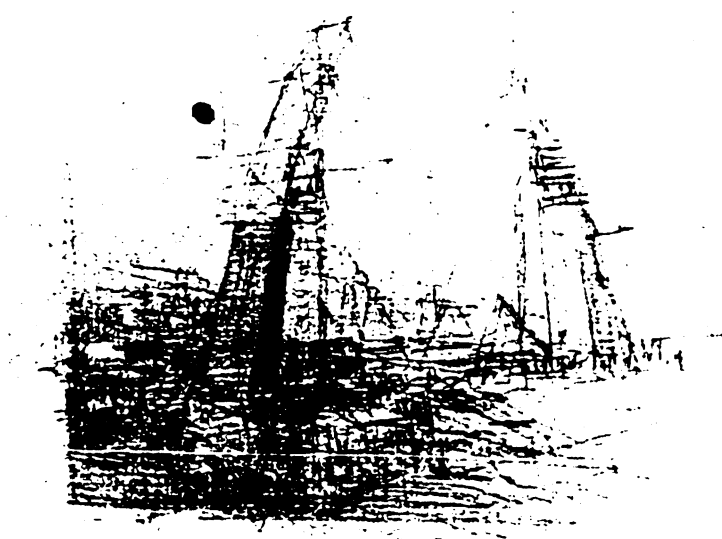


Fig. 102. Eero Saarinen. Drawing no. 17: Perspective sketch.
SOURCE: Progressive Architecture, May 1948, p. 58.

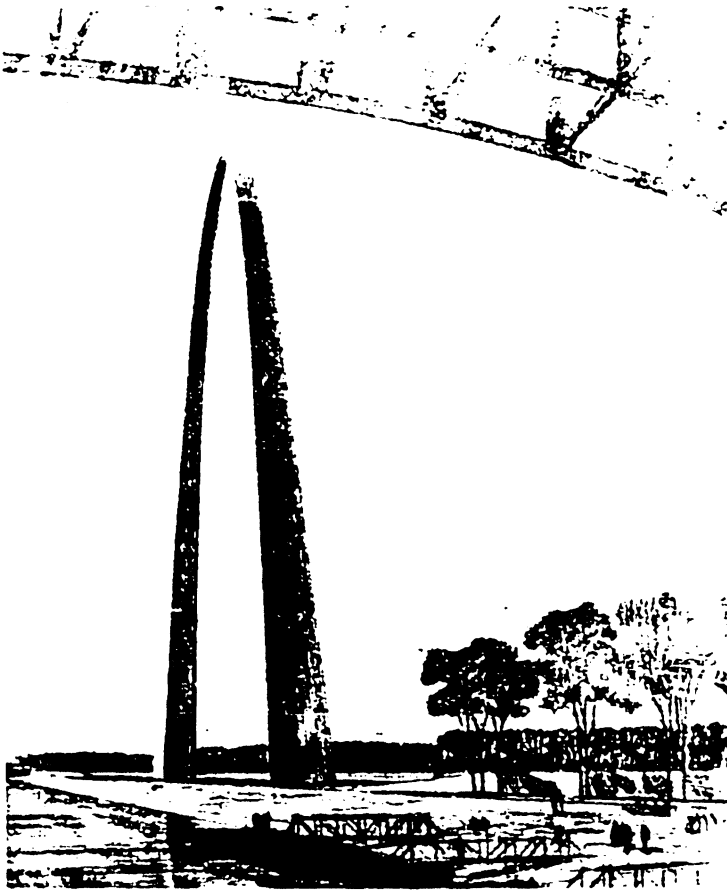


Fig. 103. Eero Saarinen. Drawing no. 18: Perspective sketch, view from under Eads Bridge.

SOURCE: Progressive Architecture, May 1948, p. 58, fig. A.



Fig. 104. Eero Saarinen. Drawing no. 19: Perspective sketch, view from Eads Bridge.
SOURCE: Progressive Architecture, May 1948, p. 59, fig. C.

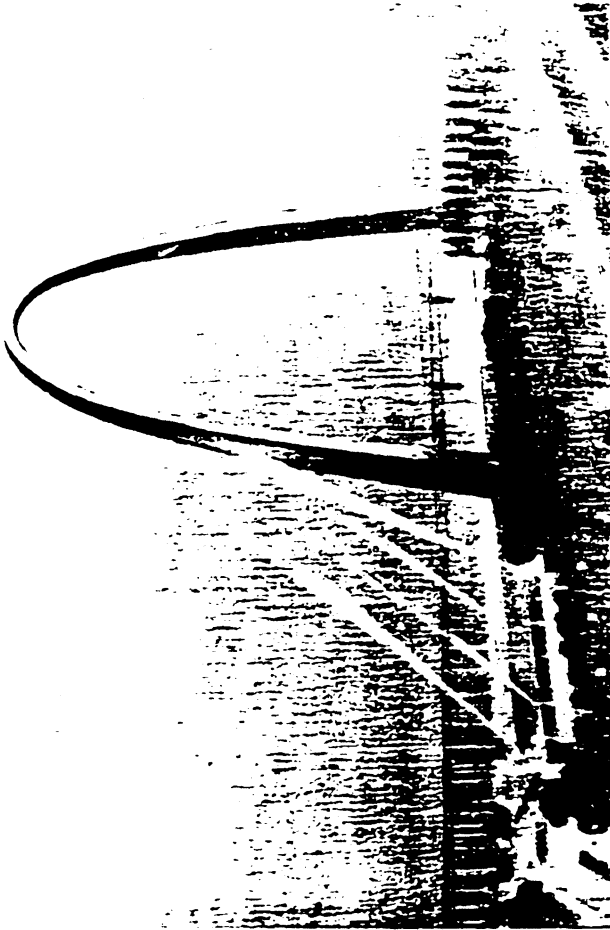


Fig. 105. **Eero Saarinen.** Perspective sketch, night view.
SOURCE: *Progressive Architecture*, May 1948, p. 59, fig. B.



Fig. 106. Eero Saarinen. Detail, drawing no. 21: Design of trees, second-stage submission sheet B.
SOURCE: JNEM.



Fig. 107. Eero Saarinen. Detail, drawing no. 21: Design of the old St. Louis houses, second-stage submission sheet B.
SOURCE: JNEM.

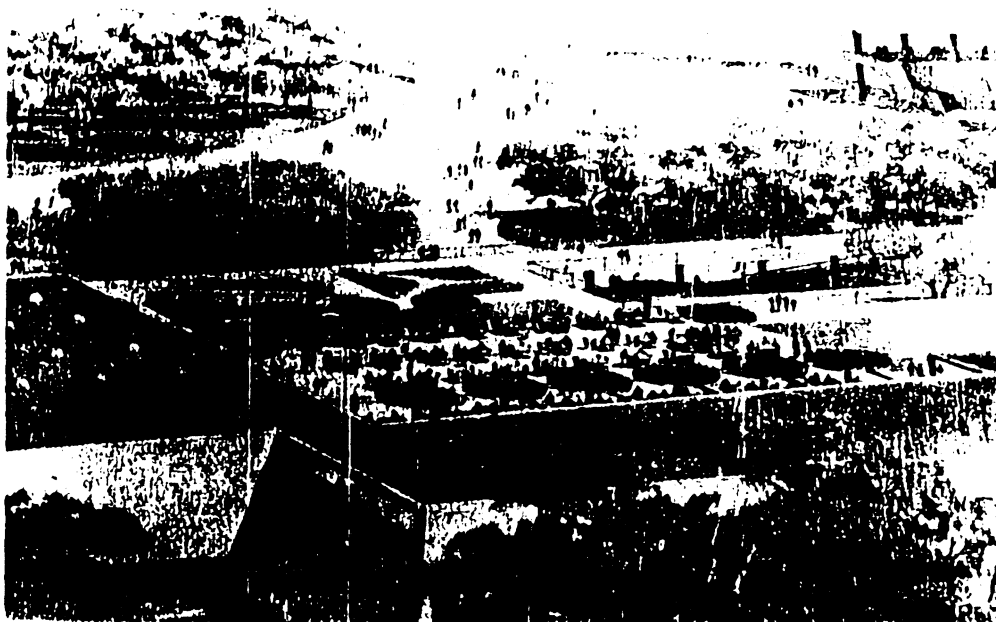


Fig. 108. Eero Saarinen. Detail, drawing no. 21: Design of the roof terrace of the museum, second-stage submission sheet B.
SOURCE: JNEM.

APPENDIX

Concordance Chart of Eero Saarinen Drawings

Eero Saarinen, "Comments on Early Sketches on the Jefferson Memorial[sic.] Expansion Memorial Competition"	Drawing no.	Figure no.
SKETCH #1	N/A	N/A
SKETCH #2	1	81
SKETCH #3	N/A	N/A
SKETCH #4	2	82
N/A	3	83
N/A	4	85
N/A	5	86
N/A	6	87
N/A (Sheet A, first-stage submission)	7	24, 88, & 89
N/A	8	90
N/A (Sheet B, first-stage submission)	9	25 & 91
N/A	10	92
SKETCH #5	17	102
SKETCH #6	N/A	N/A
SKETCH #7	N/A	N/A
SKETCH #8	N/A	N/A
SKETCH #9	11	93
N/A	12	94
N/A	13	99
N/A	14	100
N/A (Sheet A, second-stage submission)	15	26 & 27
N/A	16	101
SKETCH #P-1	N/A	N/A
SKETCH #P-2	18	103
SKETCH #P-3	19	104
SKETCH #P-4	N/A	N/A
SKETCH #P-5	N/A	N/A
SKETCH #P-6	20	105
SKETCH #P-7	N/A	N/A
N/A (Sheet B, second-stage submission)	21	28, 106, 107, & 108

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