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ABSTRACT

FLEXIBILITY AND RESPONSIVENESS IN THE DESIGN OF RESEARCH/ OFFICE BUILDING: A PROPOSAL FOR THE LOS ALAMOS NATIONAL LABORATORY RESEARCH PARK

by
Bhebishan Achaibar

Los Alamos National Laboratory(LANL) was establish in 1943 as Project Y of the Manhattan Engineering District. It was set up to develop the world's first atomic bomb. LANL is a multi-disciplinary, multi-program laboratory whose central mission still revolves around national security.(1) In it's 50 year history of design, development and testing of nuclear weapons, the laboratory has grown as technology has evolved. Today, LANL uses the core technical competence developed for defense and civilian programs to carry out both its national security responsibility and its broad based programs in energy, nuclear safety, biomedical science, materials science and other basic science.(2)

In an effort to better interface with American industry, LANL has proposed to build a research park to be constructed at the entrance of the lab. This facility will allow LANL to conduct joint research with private sector companies like Motorola. The site is 60 acres with an expected build-out of 300,000 square feet of prime office space. This research park will be host to many corporations of varying sizes. Some will occupy individual buildings, and others may share parts of buildings.

The research park is to be designed as an element of the laboratory, but architecturally inde pendent, with its own access and infrastructure. This site was chosen by LANL because it is situated at the entry to the lab and faces the approach from Los Alamos Canyon Bridge. It is here the new architecture will create a gateway to the lab and declare it as a place of cutting edge science.

The primary objective is to design a prototype building that is both flexible and responsive to clients' needs, and deals with site issues. These office structures will create a vestige of the corporate culture on par with the level of science practiced and developed by the Lab.

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1. http:/www.lan.gov/welcome/profile.hmtl, p.1
2. http:/www.lan.gov/welcome/profile.hmtl, p.1

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CHAPTER 1

INTRODUCTION

1.1 Objective

The objective of this thesis is to design a research park for Los Alamos National Laboratory (LANL). It will consist of two parts: 1. A site planning exercise and 2. A prototype office building that can be flexible and responsive to its clients' needs.

The site for the research park will be at the entrance of LANL, across from Technical Area 3 (TA3), which is the main administrative center for the laboratory. It faces the city of Los Alamos and overlooks the Los Alamos Canyon that has a 400 foot elevation drop to the canyon floor. The research park project on this given site will provide LANL a face, something it currently lacks. Since its inception LANL has not developed architecturally. It is a collection of temporary and semi-temporary structures. This is due to the policy of the Department Of Energy (DOE), the principle agency responsible for LANL's operations. Their policy is to conduct experiments not to construct buildings, so they fabricated structures that were of the minimum standards to accommodate their operations.(3) My main strategy for this site is to utilize the top of the mesa and the canyon below to create an office park that reads as a series of towers.

The objective is to design buildings that can be flexible and at the same time relate to site and weather conditions of the Southwest United States. Each building will be 50,000 square feet with its own parking garage. These buildings will sit on the slope of the mesas descending into the canyon. They will have similar architectural and functional elements. My intention is to give the Research Park a uniform style, by creating a prototype building and a method by which it will be built. This will allow the park to read as a singular place yet each building will have its own identity.

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3. Department of Energy, LANL Institunal Plan 1997 ch.1

The area now known as Los Alamos, was occupied by the Native Americans who left cliff dwellings and pueblos scattered through out the Southwest. The most well known of these people were the Anasazi ("Ancient ones"), who lived in the four corners area for about 2000 years. (Arizona, New Mexico, Colorado and Utah)(4)

In 1904 a man name Ashley Pond went Southwest from Detroit, for rest and recovery from illness. This recovery took place in the New Mexico country side near Los Alamos. So successful was his recovery he decided to stay. He then decided to open a school for boys near Mora New Mexico. However, he was practically washed away by a flood. He later founded a ranch at Pajarito Canyon now Technical Area 18 where he found success with his school. His idea was to create a place where young men can experience the outdoors while receiving a high level education.(5)

J. Robert Oppenheinmer, founder of Los Alamos Scientific Laboratory, later to be renamed Los Alamos National Laboratory, was a graduate of the boys school. This made him familiar with the topography and climate of Los Alamos. He understood that they were ideal to conduct the type of experiments necessary to build the atomic bomb. Not only was it an isolated place but, it was also at an elevation that was accessible only from two roads, which made it a fortified secure place.

Los Alamos became a central location for Oppenheimer, it meant he could consolidate the nine separate experiments he had spread out across the country. The consolidation not only simplified the process but, it removed the danger from population centers like Washington D.C., Houston, and others. All of these experiments were done with hazardous materials such as Uranium 235 and Plutonium.(6)

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4. http://www.personal.psu.edu/faculty/g/h/ghbl/southwest/cultures.html, p.1
5. http://www.lanl.gov/external/welcome/history/09_school-closes.html, p.1
6. http:/www.lanl.gov/external/welcome/history/03_why-needed.html p.1

CHAPTER 2

ANALYSIS

Figure 1 Area Map of Los Alamos (Source: Web Page & Los Alamos Guide)

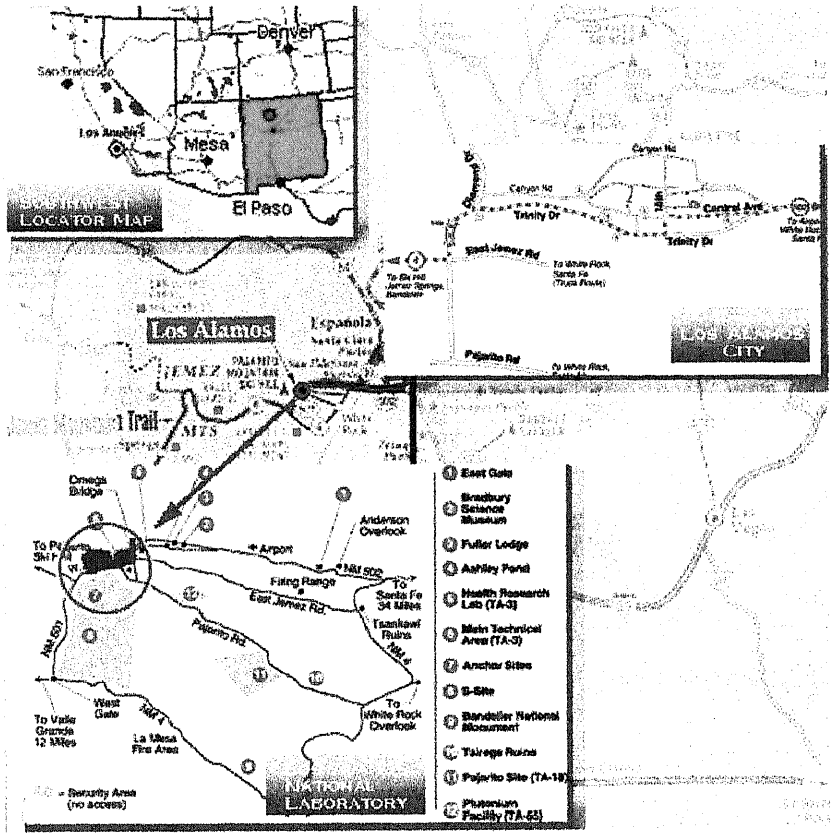
2.1 Geographic Location

Los Alamos National Laboratory, located with the town of Los Alamos approximately 35 miles Northwest of Santa Fe, occupies 43 square miles of land in Northern New Mexico.(see figure 1)(7) It sits 7700 ft above sea level accessible by two roads one from Santa Fe and the other through the Jemez Mountains west of Los Alamos. It sits a top several mesas, which are a series of ridges composed of eroding volcanic tuff or compressed ash. The lab sits across the Los Alamos Canyon, apart from the city of Los Alamos. The canyon is 400 foot deep and 850 feet wide, and is bridged by the Los Alamos Canyon Bridge.

7. http://www.lanl.gov/external/welcome, p.1

CHAPTER 2

ANALYSIS



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7. http://www.lanl.gov/external/welcome, p.1

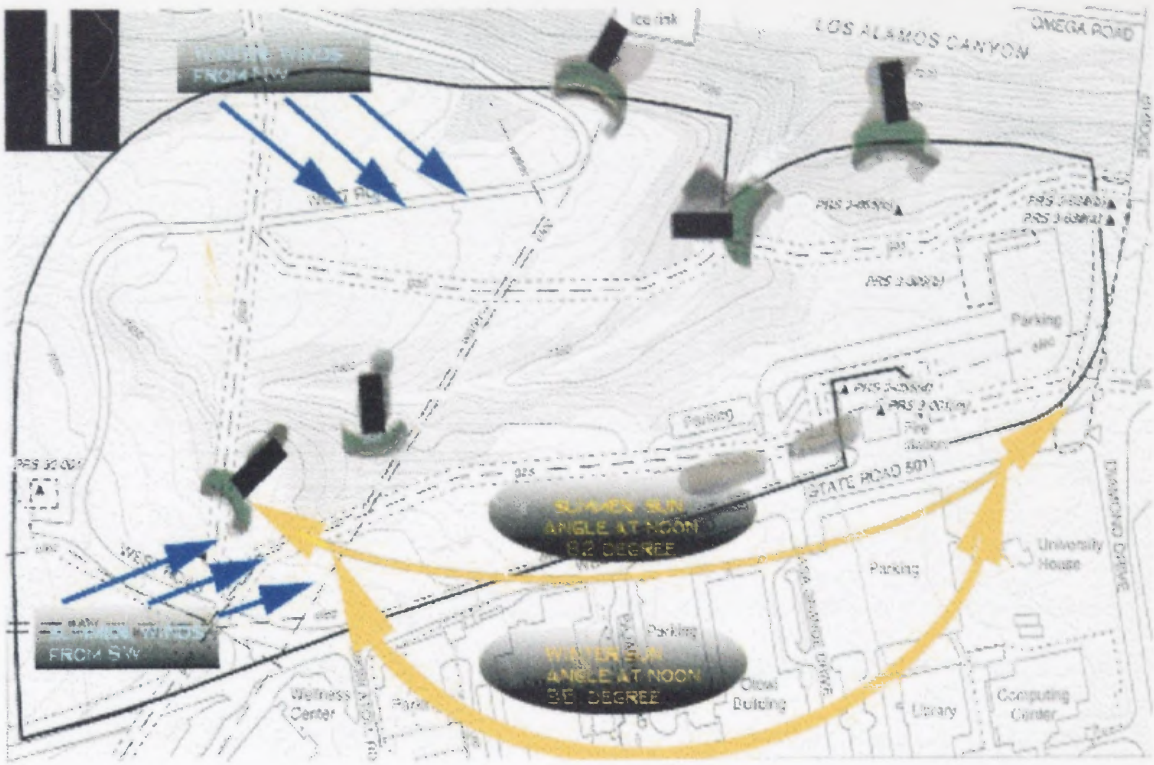

Figure 2 Weather Condition of The Southwest (Source: LANL EIS & Studio Production)

2.2 Climate

Los Alamos is in a high desert location, which exposes it to harsh and rapid change in weather. Summer conditions are temperatures of ninety degrees or higher, with little humidity. The sun angle is 82 degrees at noon and the winds are from west south-west. Winter conditions are winds from the Northwest, sometimes gusting up to 60 mph and average temperatures in the thirties, with a sun angle of 35 degree at noon.(see figure 2)

2.3 Precedent Studies

The planning group contracted by the LANL to evaluate the site has set some design guidelines for the research park. The following three are the main guidelines that will affect design on this site:

1. Buildings can not be higher than 50' above the sight line of the road.
2. Buildings can not be built land with slopes grater than 20%.

Figure 3 Elevational Change (Source: Studio Production)

3. Parking on site can only be on surface.

I chose to accept the height restriction because it has a spatial relationship to the buildings at TA 3 as well as the architecture of the Southwest region. I have rejected the others because: 1. The slopes are the most expressive feature of this site and allow for vertical structures with smaller footprints. This maintains the site integrity and facilitates an architecture that will read as a series of towers. 2. I wanted to consolidate parking for each building and protect the cars and drivers from the intense heat. I have studied the Algiers proposal by Le Corbusier as a model. I wanted to explore ways of using the slope of the mesas to take advantage of views both from the buildings and as a observer looking at the building. I have also looked at Indian Ruins of the Southwest, as ways to deal with the Southwest weather. Other exploration of office and research parks was done to understand the basic or generic requirements that make an office structure function. Issues of entry, public spaces, core design, and office types, were my main focus.(8)

The Algiers proposal by Le Corbusier has similar conditions to Los Alamos, the design was for a hillside in a region with extreme climatic conditions. He took advantage of the views, which begin at the horizontal slope of the entry then either rises or descends through the building. The building is in

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8. Paul Blanchard, Kevin Roche and John Dinkeloo Buildings and Projects,

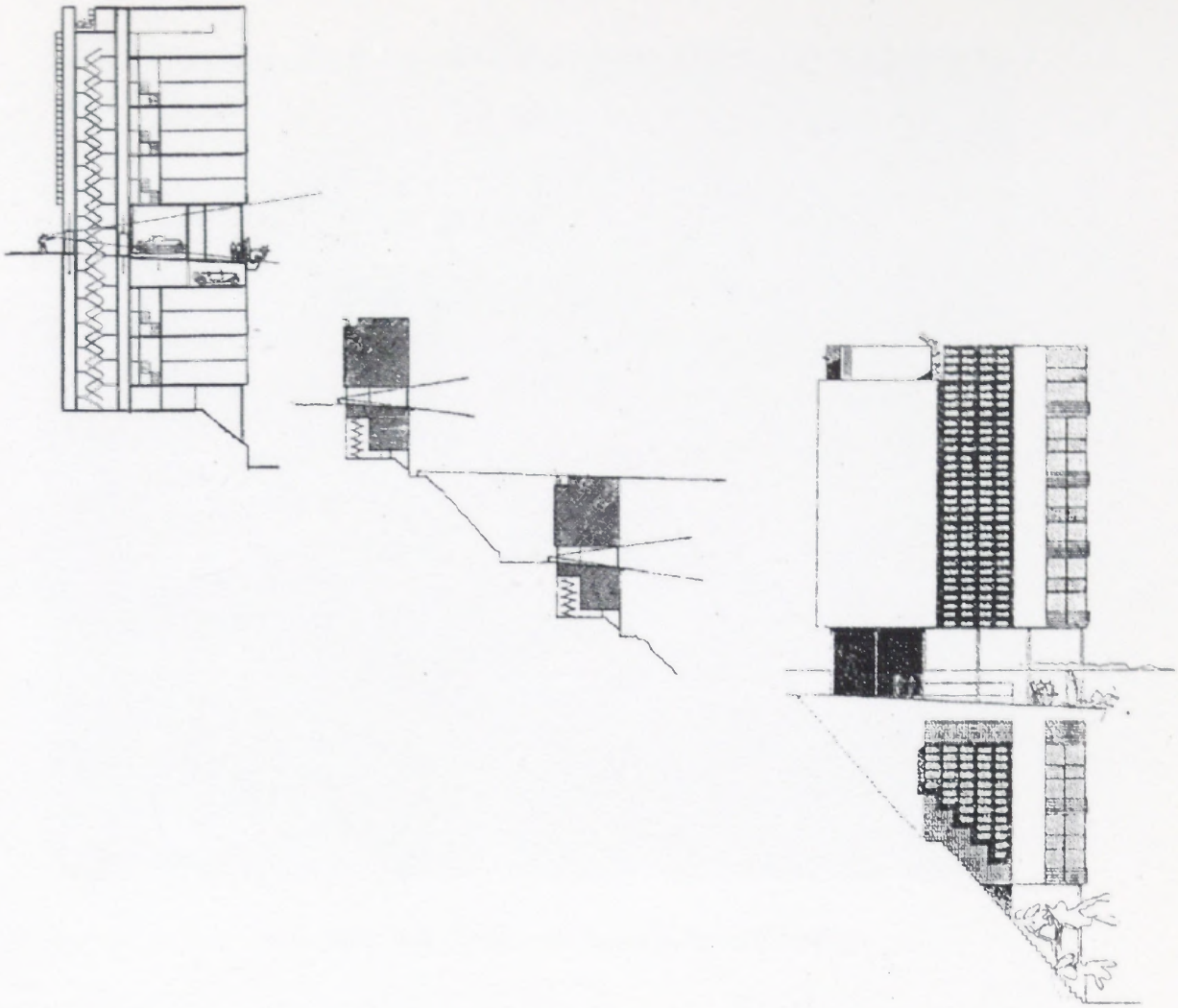

Figure 4 Le Corbusier Algiers Project (source: W. Boesiger)

two parts an upper mass and a lower mass, separated by an open plinth, which is at grade level. Each building provides parking within the structure at grade level or one floor below grade. The facade on the east, west and south all deal with sun shading devices differently which allows the building to appear unique on all sides.(see figure 4) (9)

The Anasazi of the Southwest constructed stone buildings into caverns with large over hanging ledges facing the Southeast. They purposely chose the Southeast direction to welcome the

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9. W. Boesiger, Le Coubusier Oeuvre Complete V.2, p. 172-174

Figure 5 Native American Architecture (source: Vincent Scully)

winter sun, but reject the harsh Northwest winter winds and the summer sun. The large overhanging ledge of the cliff above acted as an awning and provided summertime shade.(see figure 5)(10)

10. Baker H. Morrow and V. B. Price, Anasazi Architecture and American Design

CHAPTER 3

IMPLEMENTATION

Figure 6 Entry of LANL (source: LANL Photo and Studio Production)

3.1 Site Location

The site for the Research Park is on the northern most area of LANL. The complex will be the first image one sees upon entering LANL, from Los Alamos Canyon Bridge. The site is a mesa with two ridges totaling 30 acres of buildable land. The first of these two ridges runs parallel to LANL's main thoroughfare, West Jamez Road. The second runs perpendicular to West Jemez Road creating an "L" shaped site. The site is a rocky ledge overlooking the Los Alamos Canyon. It has an elevation change of 400 feet from the canyon floor to West Jemez Road. Much of the site has dense mature evergreen vegetation.

Figure 7 Site Plan For Research Park (Source: Studio Production)

3.2 Site Entry and Strategy

The primary entry for this site is at the junction of Casa Grande Drive and West Jemez Road, opposite the entry of LANL. There are two secondary entries and exits, at West Jemez Road and West Road, and at West Road and Omega Road across the canyon. My design is to stitch together new roads within the site and existing roads, as well as creating other rights of way for bike riding, walking and jogging activities.

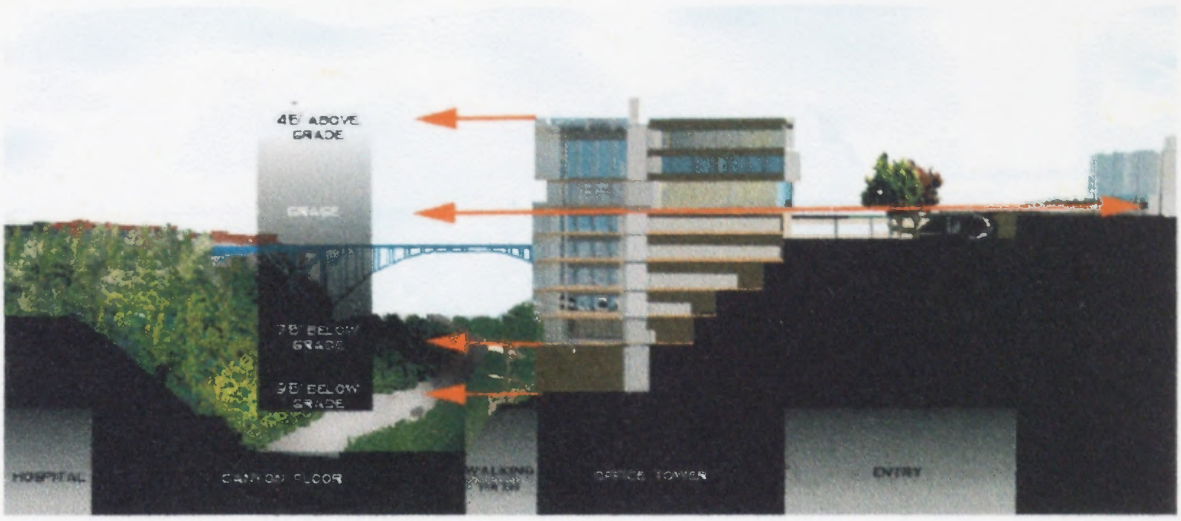

Figure 8 Building Relationship to Site (Source: Studio Production)

3.3 Architectural Relationship

The unique opportunity of this site is its elevational changes. Intrinsically, the interest is at the bottom of the canyon. The mesas edge is the main element of this site exercise. It is where the buildings sit on the site. At this point entry is created and the building separates into a top and bottom mass. The top mass relates to LANL in heights and is clearly visible from the street. The lower mass becomes a common element that repeats itself throughout the site as an extension of the mesa's edge.

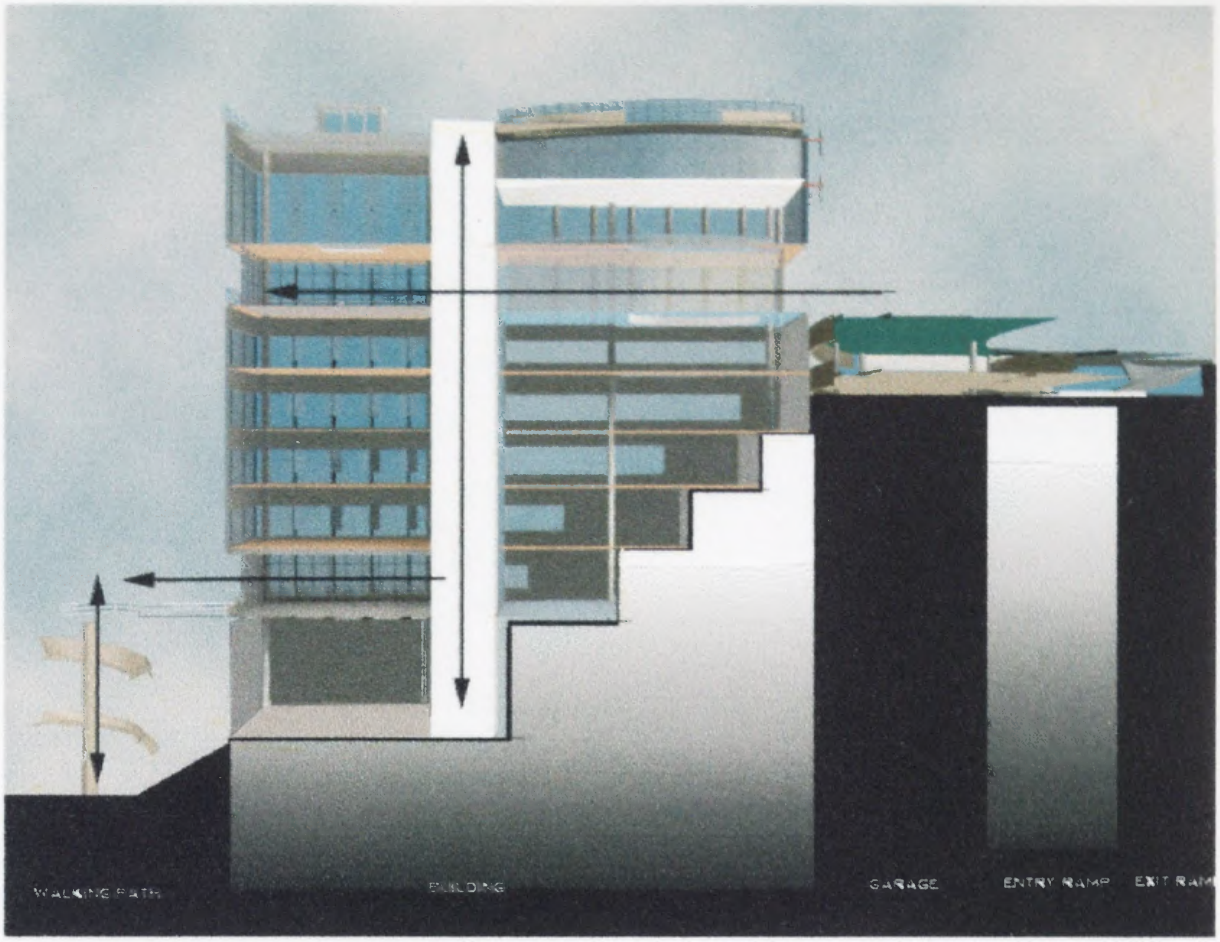

Figure 9 Circulation Corridor (Source: Studio Production)

3.4 Experiential Movements

The buildings have three points of entry: at street level, garage level and canyon level. The main entry is at street level, which divides the building into an upper and lower zone. At this point the buildings create a threshold, which begins the experience of exploring the canyon, the intent is to use this space to push horizontally into the canyon. The garage entry to the building shows how each building is connected to the mesa's edge. The canyon entry is a part of the vertical experience, this acts as an extension of the core. At this point one can experience the canyon floor via a pedestrian path that makes the connection to other buildings in the research park.(see figure 9)

CHAPTER 4

BUILDING DESIGN

4.1 Concept

The main concept is two interlocking "L" shaped structures, separated by circulation corridors, both horizontally and vertically.(see figure 9) The structure that attaches to the canyon face is a series of overlapping rectangular spaces, which are the foundation of the building. These overlapping elements are labs with support offices, they are of a masonry material such as poured inplace concrete. The overlapping "L" shaped structure that projects out and up, uses lighter materials and is more transparent. This structure divides into different elements and functions, becomes more sculptural, and gives each building its individuality.

4.2 Weather Impact On Design

The weather condition in the Southwest is an issue that has great implications on building design. The two most extreme elements, are the summer sun and winter wind. I dealt with the summer sun by using the natural topography of the site and architectural elements to create adequate shading for each building. The canyon below is shaded from the sun by evergreen trees, which make it an appropriate place to seek refuge from the summer heat creating a "summer porch".(see figure 10) The architectural elements area series of shading devices that adjust to the movements of the sun. In winter, part of the roof of each building is utilized as a winter garden. This space will always face southeast. The design will take advantage of the sun and protect its occupants from the harsh northwest winds creating a "winter porch".(see figure 11)

4.3 Prototype Design

Currently there is no set program for building design, in this research park. What I am proposing in this design study is a prototype with a generic plan and suggestions for its use. However, it has the

Figure 10 Summer Porch (Source: Studio Production)

Figure 11 Winter Porch (Source: Studio Production)

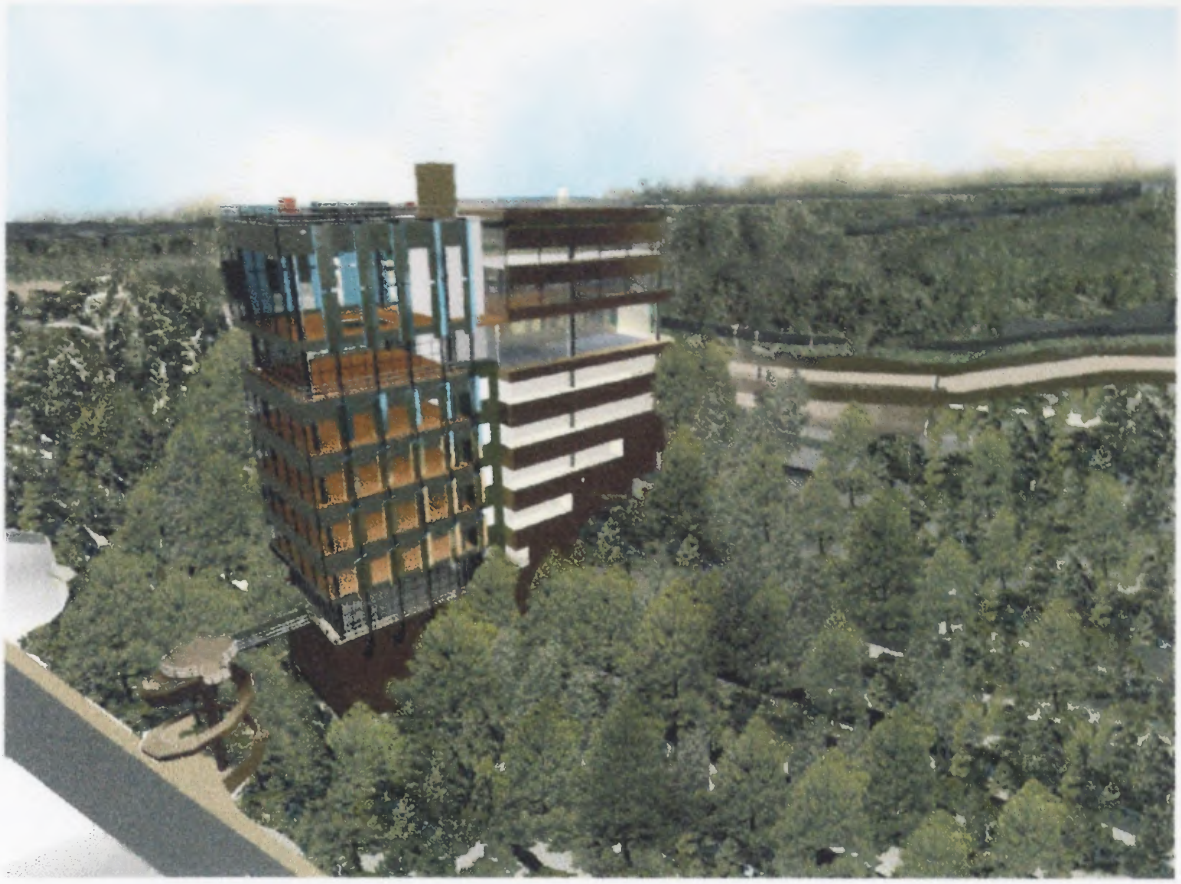

Figure 12 Prototype Building (Source: Studio Production)

flexibility to accommodate a variety of changes. This prototype will set an architectural language that will dictate future design at the research park.

4.4 Building Diagram

The building is two interlocking "L" shape structures separated by circulation corridors. The lower "L" is a singular element that remains constant through out the site. The upper "L" is split into three parts all of which can be manipulated to have specific functions. Part A, B, C, D are all related architecturally and functionally.

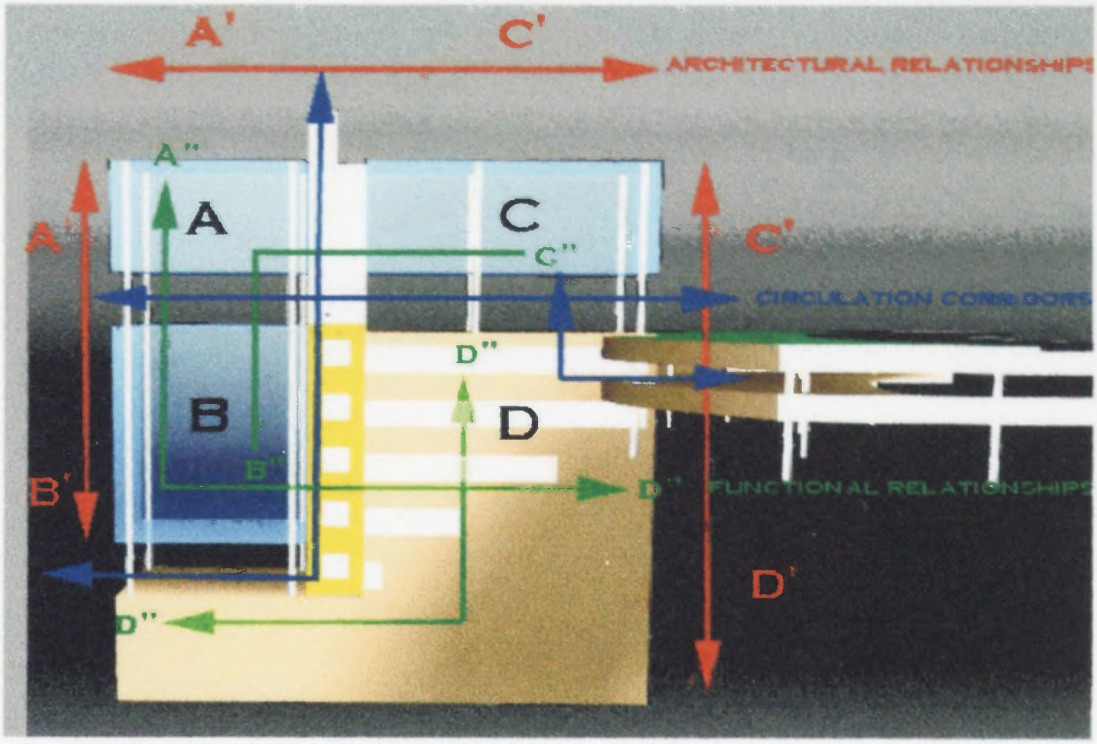

Figure 13 Prototype Diagram (Source: Studio Production)

Proposed Functional Elements

A	Administrative element	C	Administrative support element
B	Managers element	D	Technician element

Architectural Relationship

A"—C"	A'—B'
A'—C'	C'—D'

Functional Relationship

A"—B"—D"	A"—B"	D"
C"—A"—B"	B"—D"	

CHAPTER 5

CONCLUSION

The Los Alamos National Laboratory has been a part of our national security for 50 years, in that time it produced the first atomic bomb and developed our nuclear capability. Today, its mission is "Reducing the global nuclear danger" and partnership with industrial firms to bring laboratory-developed technology to the assistance of the overall competitiveness of the US economy.

Since the advent of the nuclear age LANL has developed a variety of technologies as part of its work. It is this technology that they are seeking to disseminate and apply in-joint research with industries. Their intention is to have a facility with proximity to LANL, where personnel from the research park can exchange information and conduct experiments at LANL. The purpose of such experiments is to package the laboratory-developed technology for use in commercial application.

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