

SPECIFIC LIGHT IN SCULPTURE

by

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Submitted to the Department of Architecture in
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Master of Science in Visual Studies

at the

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ABSTRACT

Specific light is defined as light from artificial or altered natural sources. The use and manipulation of light in three dimensional sculptural work is discussed in an historic and contemporary context.

The author's work with metal arc light sources is presented and documented with developmental drawings and photographs.

The use of light sources in space to define volume and mass is seen as the natural development of artificial light as a viable material in art.

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The artistic insights that have driven my work are here defined in the terms and nature of light. Light is so obvious a force in any artistic work that light is or has become a 'given', but light is not so all pervassive as one might assume. Where is the light that drives music? Or a painting. The light that drives and determines life. Light is energy transferred and transformed.

This thesis has been written in three parts. The first part is a selective history of the use and changing awareness of light in structure. The second part is a compilation and comparision of contemporary artist who have or are using light actively in their work. The third part makes use of my own work over the past five years with active light, and places it in a context derived from the contemporary use of specific light sources in urban enviornments.

I use light as a physical part of the sculpture. In my subjective analysis of light in structure I see light as palpable and material as any other traditonal work of art. I believe that light used materially still carries with it all the symbolic and ethereal aspects that inhabit its being and with which light animates our world.

OF INTEREST TO THE READER

As a student and worker at the Center for Advanced Visual Studies at the Massachusetts Institute of Technology for the past four and half years, I do not feel that I can bring a dispassionate eye to the work of the Center. In light of the above (no pun intended), I have not included Center projects or individuals, for the most part, in this thesis. There are numerous catalogues and documentary material available in the libraries of MIT on the Center, and this material should be consulted to attain a balanced view of light in art in the twentieth century

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RESUME'

VI

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EDUCATION

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1987-89 Art and the Environment

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Teaching Assistant, 3\D Program
Hollow Ware
Supervision of undergraduate
independent study students in large
scale metal casting

Penland School of Crafts, Sculpture 1984

Haystack Mountain School of Crafts, Forge work 1983

Centrum, Port Townsend, Washington, gifted and
talented program, State of Washington 1981

Artists in the Schools, State of Idaho 1972-80

EXHIBITIONS

1988 Otto Piene und das CAVS, Deutscher Kunstlerbund,
Badischer Kunstverein, Karlsruhe

Interfaces, Artists and Technology, Festival
Gallery,
Lancaster, Ohio

Graffiti Wall, An installation at Boston's First Night at the bandstand in the Common. Interactive light, dance and music designed and built by the artist.

1987 Sky Lights, Environmental installation with holograms

and specific wavelength light sources, solo show Bromfield Gallery, Boston, Ma.

Boston Now...Projects, Street Lights, an installation

on Thayer Street, Boston. The Institute of Contemporary Art, Boston, Ma.

Clear Lights, an installation for Boston's First Night

interactive audience, live musicians, light structures, performance

1986 Flash Lights, installation at the Sky Art Conference at the Center for Advanced Visual Studies, MIT. Mylar, helium, flashbulbs

11 7\8 inches=Nanosecond, installation at Mobius, Boston with "PHYLOMEN" performance group

at Ballet "Refrigerator" by Gamma Skupinsky presented Jordan Hall, New England Conservatory of Music. Light structures, interactive video and choreography

Grid Lights, installation at the Massachusetts Transportation Building, mercury vapor, sodium vapor and incandescent lamps

Alcheme' Gallery, Boston, Ma., an installation in granite, cast iron and quartz light

Light Steps, installation for Boston' First Night. mercury and sodium vapor light

1985 Wave Front, installation in Thompson Gallery, Mass. College of Art, mercury and sodium vapor lamps

light Line, permanent installation at 63 Stuart Street Boston, Ma.

Incandescent Light, collaborative installation at CAVS\MIT

1984 Ritual Vessels, cast bronze vessels at Mass. College of Art

- tidal Light Tides, Boston Harborfest, Peddocks Island
flats, plexiglas, aluminized mylar
- 1983 Wall Works, group show at Carson-Siepro Gallery,
Denver, Co.
- 1982 Installation, wall and floor work, University of
Idaho, Moscow, Idaho
- 1981 College of Southern Idaho, Solo Show, Twin Falls,
Idaho
- Bernice Steinbaum Gallery, NYC
- 1980 Installation, large scale work and lithography, Sun
Valley Center for the Arts, Sun Valley, Idaho
- Centrum, Port Townsend, Washington
- Installation, Boise Gallery of Art, Boise, Idaho
- 1979 Yellowstone Arts Center, Billings, Montana
- 1978 Ponds and Streams, exterior installation at the Sun
Valley Center for the Arts, Sun Valley, Idaho
- 1977 Corpus Christi College, Corpus Christi, Texas
- Cheney Cowles Museum, Spokane, Washington
- 1976 Cypress College, Cypress, California
- C. M. Russell Museum, Missoula, Montana
- 1975 Galeri Baaskul, Drimmlen, Netherlands
- 1973 Crossroads Gallery, Baker, Oregon
- Arttrain, Western States Arts Foundation
- 1971 University of Idaho, Moscow, Idaho
- 1970 Portland Art Museum, Body Covering, Portland,
Oregon

Light is the physical evidence of our reality. Our awareness and life is presented to us by light or the phenomena that have gained the word "light". The combination of energy levels, field effects and visible luminosity that make up

the curious qualities of the radiant environment that surrounds us is integrated so deeply with what we consider the normal or accepted pattern of our world that we hardly question the actuality of light. The puzzle of visible luminosity and its' separateness from physical reality, or even whether luminosity could be separated from the physical world, were major philosophical questions of the ancient world¹

Intellectual dissatisfaction with classical discussions of light and optics led to a number of later investigations, notably in the work of the Arabic scholar and scientist Alhazen(965-1039 A.D.). His investigations into reflection and refraction, included discussing the construction of a camera obscura; the introduction of miniature moving scenes into darkened rooms. His search for a solution to the dilemmas left by classical scholars began with the nature of light. In defining the mechanisms of vision based on the

¹The Nature of Light; Vasco Ronchi, Harvard University Press, 1970. pp 9-32.

physiological characteristics of the human eye, he arrived at the description of the ray or point of propagation of light. Alhazen's point of propagation went to the eye as a ray of light and there mysteriously became vision². More important, perhaps in historic context, was Alhazen's work with reflection and refraction. His work encouraged investigators in Europe. By the time his writings were translated and published in the sixteenth century, they served to validate the theoretical methods of research spreading from the new centers of learning in Europe. Separating the physical nature and characteristics of light from the objects that are revealed in its presences is the first step on a long road of discernment and awareness that leads to accepting light as being as palpable and solid as any other part of the immediate environment.

The debate over the nature of the quality of light followed a long path, weaving its way through medieveal spectacle makers, glaziers and builders of chandeliers. Three hundred years after the introduction of spectacle lenses for reading, an intellectual discussion occurs. Della Porta(1535-1615), in a book of parlor magic, or curious inventions describes the action of "lentic shaped transparencies" on far scenes and fine print. The value of his book lay more in the wide spread acknowledgement of the presence of lenses as actors on the rays of light rather than

²op cit Ronchi pp 49-56.

any enduring addition to the literature on the subject. Kepler(1571-1630) sites Porta's Magia Naturalis as the source for his work with the camera obscura as well as the inspiration for his description of the inner workings of the eye--the first recorded instance in western literature of presenting the retina as the part of the eye receiving the light image.

Light was now presented as effector of image rather than a causul part of an image. With this concept firmly in place, Galileo's(1565-1642) discussions of the positions and time lags of the appeareance of Jupiter's moons from behind the great Jovian disk gives light time, a measurable velocity. Hooke(1635-1703) and Huygens(1629-1695) investigation into the micro- structure of life and observations concerning the color abberations surrounding images formed with a lens led Newton(1642-1726) away from optical devices to investigating the properties of single optical elements. Newton's personal distaste for Aristotelian-Scholastic thought led him to define a system of natural philosophy that became a major tool in his investigation of the nature of light. By concentrating his efforts on a single phenomena, Newton was able, over a period of thirty years, to assemble a unified theory that would become the blueprint for optical investigations for the next three hundred years. As with many strong figures in science and philosophy, Newton became the center of a dogma that

extended his principles of inductive analysis to wider fields of inquiry, while rejecting the theocratic rationalism that was the heritage from his contemporaries.³

The intellectual and scientific investigations on the nature of light were paralleled in the arts. Many of the investigators of the 16th and 17th century used empirical methods alien to the Scholastic tradition of the Middle Ages. Galileo built his own telescope, Hooke and Huygen developed theories about the deployment of light in space from their microscopic investigations. Direct work with real materials was the realm of tradesmen and artists in the 16th century. Artist during the Renaissance were strongly indebted to a crafts traditon and at times were indentured to their patrons. An artists work, especially grand works, were often at the behest of rich and powerful individuals. In the scientific literature of the 16th and 17th century there is no mention of the pragmatic utilization of optics and reflection/refraction. Giotto and later Durer use the system of perspectivia, based on the phenomenae of the camera obscura to revolutionize composition and include light in two dimensional work. The cities of the new trading cartels demand light for interior spaces, grand salons and light for the immense enclosures built to house their faith.

³The Development of Newtonian Optics in England; Henry John Stefans, Science History Publications, New York, 1977:pp17-35

Venetian and French manufactures more interested in product than theory began an evolution of process that would lead to the immensely complex reflection\refraction machines used to enhance the radiance of thousands of candles. The vast lumineres of the 17th and 18th centuries were products of competition and closely guarded trade secrets, all but lost to contemporary record.

Fresnel's investigations with light were perhaps the most mechanistic yet conceived. He used magnification to enhance his observations and designed and incorporated a measuring device into his magnifying lense. Until Fresnel, observation of diffraction phenomena was limited to projection of an image onto a translucent screen. His dissatisfaction with the corpuscular (Newtonian) theories of light propagation along with his own direct observation and measurments allowed him to deduce a cohesive wave theory of light. Fresnel's work allowed the separation of the structure of light from the phenomena of light. The complex matrice of observation and experiment could be reduced to steps, single experiments, opening the potential to test for the actual velocity of light, and eventually the advent of insights into the relationships of light and mass. The most obvious outcome of Fresnel's work being the great lighthouse lenses, actually enormous composite structures using precisley positioned prisms to direct the illumination of oil lamps as far as ten miles to sea. His theories also allowed

the production of the first "flat" lenses, the common front lenses in theatrical lights, automotive head lights and so on. The advent of practical electric illumination systems within thirty years of Fresnel's death, harbingered an explosion of direct illumination sources that continues today. Holographic lense systems are based on Fresnel's theories of wave interference.*

Discussions of time and light along with the first definition of light as substance. (In other words a medium that could be acted upon, measured and described in terms consistent with other aspects of the physical world) led to experiments that gave reliable velocities or speeds of propagation for light. A vast realm opened out to anyone with the skill and language (mathematics) to enter in. Light measured the depths of the Universe, the age of the stars and in itself showed evidence of marking time perhaps changing time to match its physical presence.

In the classic tradition of Aristotle and the Scholastics that directed the lines of inquiry followed by philosophers and theorists in the Middle Ages, light had two personae: lumen, the physical light of the corporeal world, and lux, the sacred metaphorical light of the soul. In art, the artist sought to liberate this inner light, lux, from within the being of the work. The philosopher had his own

*Optics; Eugene Hecht, Addison-Wesley Publishing Company, 1987. pg 5.

work that liberated the light of the soul, alchemie. This strange mission of inquiry, alchemie, was a ground where artist, craftsman and philosopher could meet. The search for a natural philosophy that would reveal the ultimate perfection of the world was symbolized by the radiant stone, the philosophers stone. The search, by charalatan and failed doctor, as well as philosopher and gentleman, would result in many aspects of the real world opening out, illuminated, for the first time as pragmatic reproducible presences. Even the name of this strange discipline, alchemie, fore shadows a new philosophy, a new science, chemistry. In the rigid structure of scholasticism, there was no room for inquiry. Tradesman and artist had to ignore the old philosophy because it could not build the cathedrals or make the stained glass and wrought iron they produced by the ton. The natural philosophers, educated and steeped in logic, had only alchemie as a way to fit real pieces to the world around them. As the lines between tradesmen and scholar blurred, a new kind of artist appeared.

The men who built the Gothic cathedrals were anonymous. If you walk the inner galleries, the occasional masons mark comes to light, or some bit of extraordinary iron or glass work, attributed to a legendary personage, is exposed. In the late 14th century personalities began to emerge. Men with personal vision so strong and singular in execution or technique that there was no possible way to submerge their

work into a homogeneous structure. Giotto and Fra Angelico painted light onto the walls of their churches.

"....Giotto's works, according to the accounts of his contemporaries, must have made a profound impression.

They appeared almost terrifyingly realistic, so true were they to the spirit of nature in their clear and luminous color, their free movement, and their power to to suggest space."⁵

For da Vinci and Michelangelo, light was the revealing spirit of mass. Without nature's "contribution of shadows more or less deep and of lights more or less bright the work would appear all of one tone like a plane surface".⁶ Michelangelo let light into the block. His notes and poetry record a life long battle with release and illumination. In seeking his personal vision, he opened the block, releasing the figure.⁷

Bernini used light as part of each work. Letting in windows behind side chapels, glazing them with colored glass, siting works so that shadow and color accentuated aspects of the work throughout the day, even to times of the year, were all part of each tableau his workshops created and installed.

⁵The Materials of the Artist and Their use in Painting; Max Doerner, Harcourt, Brace and Company, 1934. pg. 322.

⁶Leonardo da Vinci quoted in Sculpture: Process and Principles; Rudolf Wittkower, Harper and Row, 1977. pg. 101.

⁷op cit Wittkower, pg. 133.

Sebastiano Serlio in The Five Books of Architecture presents the Pantheon as "Among all the ancient buildings to be seen in Rome, I am of opinion, that the Pantheon...is fayrest...that the excellent workman, which invented it,...was of the opinion that this work would have but one light...others have their chapels...and windows that are dark...the one light moves so to reveal..."*

the entire building. The experience of being in the Pantheon and watching the great oculus, or eye, surround the floor with light is unforgettable. Interior light in ancient buildings was of the utmost importance. The play of natural light on the interior softened or revealed structure. The lightening of great mass was possible, as Serlio notes, by placing dark before light, mass revealing light at its depth. These massive structures, built before illumination from remote sources was possible, all relieve great mass with light. The cathedral at Cologne makes use of color in the great window and contrasting blue greens at the sides to give an enhanced feeling of height and length to the interior. The great rose window has a two fold task; as a tympanum, reflecting the chant from the choir the length of the narthex, answering the chant with their own echo as they finish each stanza and fixing the light transmitted to the interior in an orange red glow stopping time with light in

*The Five Books of Architecture; Sebastino Serlio, facsimili edition from Dover of the English edition of 1611, 1982. pg.the introduction to the forth chapter.

space.

Lighting interiors of large structures remained a matter of opening walls and relieving window frames until the advent of gas light. The Palace of Versailles is probably one of the best surviving examples of a pre 19th century solution. The enormous chandeliers, literally candle holders, used hundreds of glass prisms to reflect and direct the tiny flames. Ceilings and walls had mirrors placed to double and triple the apparent image of each luminaire. By contrast to the great reception halls, the galleries and lesser rooms had wall sconces provided with speculum metal reflectors. Some rooms had only small hooks to accept the tapers used by servants and guest alike to make their way through the endless corridors.

The Pantheon's single central oculus had its drawbacks, not the least of which was inclement weather. The baptistry in Pisa, one the earliest large structures of the late middle ages, has a gutter cut around the interior floor, and scuppers to let the accumulated rain water out. In the 17th century a small dome set on pillars was added over the oculus, admitting the light, and keeping the weather outside. Opening the center of a massive masonry dome to light served two functions. It structurally lightened the roof and transformed the interior from a dark space to one lit from above. In the European countries of the Mediterranean rim, stoa or portico shaded and protected the

entries of buildings from the sun. As an individual progressed from brightly lit piazza to portico and entry, his eyes did not adjust as rapidly as the apparent light level fell off. By contrast, illumination streaming from the center of the interior, far out of view, relieved and opened the interior space. The temple of Apollo at Didyma used a similar device in the revelation of the mystery of the central ritual of the priesthood. Never completed, the surviving ruins of the temple provide full scale drawings of building details engraved on sub-floors and interior walls. The entry led through a long columned exterior space to two small tunnels, dark corridors, leading to the adytum, a natural area within the temple, open to sky and with undisturbed earth as floor. Here the naiskos was built. This tiny building was the seat of the cult, separated from the world and artificially lit by reflection and contrast. It must have seemed an apparition to initiates entering the adytum*.

A more recent example of natural light and contrast can be found in the architecture of Luis Barragan. Working in and around Mexico City, Barragan makes use of indigenous materials to accentuate and relieve the harshness and brilliance of light on the alto plano surrounding Mexico City. In the Chapel for the Capuchinas Sacrameantarias Del

*Scientific American; vol 253, # 6, Dec. 1985. The Construction Plans for the Temple of Apollo at Didyma, Lothar Haselberger. pp. 127-131.

Purísimo Corazón De María at Tlalpan, Mexico he built and bequeathed to the Franciscan Order of nuns a chapel and garden. "Over a period of three years, Barragan designed and built...the walls are roughly textured, painted in a luminous lemon color; the floors, of large wooden planks, release a honey-colored glow. The chapel is pervaded by a delicately warm light. Throughout the secluded convent, sun is the ineffable presence."¹⁰

Passive light in the open air was the order of the day for the vast majority of the history of human structural\environmental interaction. Artificial illumination sources are expensive, both in energy and economic terms. Oils and fats used in stone lamps 60,000 thousand years ago were derived from food sources. It takes little imagination to see a direct correlation between artificial light and adequate food production. A successful stable society or living group can afford to use food for light--or perhaps to sacrifice to fire for light. Would it be far from the small burning bowl of fatty meat to intended light source used in dark caves to illustrate future or past hunts? Pure speculation, but at LeMoustier cave in France, small stone bowls with residues of fat and carboured wicks have been found, along with elaborate paintings in areas

¹⁰Orion Nature Quarterly; Luis Barragan, text by Emilio Ambasz, vol. 6, #7, Spring 1987. pg 64.

requiring some form of illumination.

Massive exterior illumination, great fires, volcanic eruptions, auroras or lightning strokes all are common phenomenae. But the earliest recorded attempts at directed exterior lighting date from 500 B.C. The Chinese used natural gas to light the streets of Biejing. Antioch lit the central business district in 500 A.D., to the delight of local merchants. Pliny, in the volume of his travelogue devoted to Egypt goes into elaborate detail, describing the Pharos or light house of Alexandria. Ordered built by Alexander the Great, dedicated in 279 B.C., the lighthouse was at least 120 meters tall¹¹. Ptolmey, in a contemporary account asserts that a great crystal reflector directed the rays of the lantern to sea at night, and allowed the viewing of vessels far out to sea during the day. The Collosus of Rhodes and a series of watch towers established by the Romans in their relentless republican march up the penninsula latium in pursuit of the Etruscans all lay ground for ever broadening use of light in structure. Even aerial bombardment had an antecedent in greek fire, a mixture of sulfur, pitch and bitumenous earth, hurled between fighting galleies at sea and against fortified towns. The most magical ancient legend is of Aristotle, consulted by desperate Atheneans under siege, advising the generals to

¹¹Alexandria; E. M. Forster, Anchor Books, Doubleday and Co., 1961. pp.144-150.

have their soldiers polish their bronze shields and direct the reflection of the sun onto the rigging and sails of the invading fleet, setting them afire. If true, the legend fits well with stories of analog calculators dredged from the Aegean, and far seeing glasses high on towers looking towards the sea. The practical world of merchant and soldier and incidental record of every day event, handed down from man to man, may speak more of the truth of ancient technology than meticulously copied and annotated text, translated and retaught by men with no knowledge of the original language or world. To these later scholars only a djinn or spirit could possibly have built a tower with a great light that ships could see when still two days from land.

The Roman senate would periodically enact laws authorizing the setting of torches or lanterns at particularly troublesome intersections. Fire and light were part of the ritual of the establishment of the primordial settlement on the Capitilian Hill. Each spring the keepers of the fire would recite to themselves Rome's secret name and make burnt offering to the spirit of place that protected the precinct. Festivals of Spring or Mid Summers Night Eve enacting or reinventing the sun followed a labyrinthium path to the present and the twin modern rituals of festival of light\Christmas\new years and Passover\Easter. All recounting an ancient fear of a dying sun, shorter day renewing, earth bearing fruit and warmth once more in a

miracle of light.

Light practical and serviceable contrasts with light manipulated and choreographed. The solution to one problem, large scale public illumination, brings with its technology a taste for the possible control and presentation on a far more extravagant scale. The Chinese fire dragon arching high over a new emperor, kites streaming sulphur and phosphours with more arrows flaming skyward to send the kites down in searing colors all astonished western travelers, barbarians to the Chinese. The only part of this strange technology of light and fire to reach the west was a formula for magic arrows in Roger Bacon's notes, widely read, although ill used, for spraying fire at wooden shields and ships canvas. A 15th century gun let all know its placement, by day with the plume of smoke, at night with the spectacular display of half burnt wading, tallow and gunpowder. Benvenuto Cellini, a renaissance craftsman and goldsmith, as well as canoner to the Pope, let Rome's beleagured citizens know Francis II troops had retired by loading his guns with "divrse salts and metals which exploded in great colors" and firing from Clementines fort, Constantines tomb, over the Tiber.¹² From the 17th century to the present the City of Paris has illuminated the Seine with massive firework displays, building plastic monuments of burning fire, not the

¹²Autobiography of Benvenuto Cellini; Penguin, 1968. pp 128-132

least of which will be displayed in July, 1989. The massive effect of blinding light and deafening concussion in an altogether non-threatening atmosphere is soul freeing. Fireworks are true architectures of light and fire, perhaps environments of sound and smell as well. The apparent ease and endless arch of fire slowly descending to earth, followed by latent report is hard to erase from vision and memory. The structure of this light waits out of reach to be exploited in art. Each fractional second event never quite repeated. How to construct a fountain of fire that rejuvenates itself would certainly be an admirable task. The task before light artists, or sculptors, essentially is the same. Light defines space and volume in sculpture, and making it a physical aspect, part of the materials married in one work liberating light from the role of partial partner, more to be feared than exploited.

The most obvious manifestation of manipulated and palpable use of light in structure is theatre. Valerius Maximus(37 A.D.) mentions the use of various colored awnings, affecting the suns rays, and thus the set and mood of the performance. But from the first century to the mid 16th century there is little mention of specific lighting systems. Anecdotal records of passion plays, and effects of fire and burning angels, as well as stories of actors beating hasty retreats with burning breaches lend immediacy to accounts of

the use of open flame in early theatre¹³. Serlio discusses the problems associated with bringing the theatre in doors, and among his designs for stage buildings, furniture and equipment are directions for altering the colors of lamps by "directing their rays through bottles of red or white wine or solutions of aqua vita, vernis and vitrol". The red and white wine would go to good use after the performance, but what to do with old copper dissolved in nitric and sulphuric acid. Inigo Jones, a painter as well as a producer on the English stage in the early 17th century, used multiple wicks in single lamps and polished metal reflectors to direct, intensify and color light. Foot lights, small bowls containing oil with floating wicks, smokey flames quivering on the edge of the stage, wooden hoops suspended over actors heads with dripping tallow candles flaring and dropping intensity as pockets of water or fat climbed up the wick, small boys racing around with wet sponges on the ends of long poles, and men stationed in the wings with buckets of water to douse flaming costumes makes for an image of exciting stage lighting if not particularly reliable. By the end of the 17th century the sophistication of audiences and demands of patrons forced theatre lighting to alter time and place on the stage. The limelight, a device whose name is still with us, was the first directed spot light source. By

¹³Stage Lighting; Theodore Fuchs, Benjamin Blom, Inc., New York, 1964. pg.34.

directing the flame from an oil or gas lamp against a piece of soda ash or lime, a bright greenish yellow light was produced. The intensity and brilliance of the light exceeded anything known in the late 18th century. Spot lights with reflectors, lenses, and color filters all were available by the 1840's. In the Paris Opera electrically driven arc and limelights were in use by the late 1860's. Dramatic use of light and color on stage were assumed in major productions. Most large theatres had systems that allowed them to brighten and dim house gas lights as well as the increasingly sophisticated grid and proscenium lights. Incandescent electric lighting systems rapidly replaced gas systems in the 1890's, with most dimming and projection systems represented in major houses by the first world war. Illumination systems that allowed direct manipulation of time and place were essential to the modern theater. Opera, in particular romantic tragedy, constantly sought to produce extravagant displays of complex effects. Open flame was dramatic but unpredictable. The use of fire works was not uncommon. During the first performance of Hayden's Royal Fireworks music, the reviewing stand and banquet hall burnt as well as the barge launching the rockets. Arc and incandescent sources provided reliable and physically transformable light.

Public lighting has been a function of convenience and governmental edict. As early as republican Rome,

municipalities have required private citizens and public houses alike to light the streets their buildings faced. Most old Italian cities still have iron baskets and torch rings fastened to walls and gateways. In Paris, during the 16th century, the first lieutenant of police decreed that each cross street would be illuminated until a specific hour each day, from All Hallows eve to the beginning of Pentacost. The fire baskets provided by the municipal government, the fuel by the local citizens. As recently as 1880, the city of Los Angeles required saloons and houses facing main thoroughfares to provide a lamp visible from the street. The quality and intensity of light sources with such arbitrary requirements must have served more to alleviate the infinite dark corridors that narrow streets became at night than to provide the virtual lakes of illumination that we now assume as public lighting.

The use of light in public spaces altered with the advent of centralization and concentration of economic and material wealth. Ordering local citizens to maintain a light visible to passerbies and providing oil for 15,000 street lights are orders of magnitude apart in the logistics and consumption of resources involved. At the beginning of the 18th century natural gas and coal gas(the product of incomplete combustion of soft coal) were used in England and France for exterior illumination. The street lighting systems that emerged from these first installations were the

beginning of modern utility distribution networks. The systems also are the first time whole cities and the citizens therein experienced remotely controlled environments of light. The thousands upon thousands of gas lamps that over a period of twenty years replaced the oil lamps in the streets of London were attacked by philosophers and intellectuals as unnatural and unhealthful. Robert Louis Stevenson's lament on the life of the old lamplighter seeing his first gas lamp "who's wick was never trimmed nor bowl filled, for want of oil no flickering flame" was a thin veneer of humor over Stevenson's own horror of any remotely controlled or contrived light source. He found particularly repulsive the arc lamps hung a hundred feet over streets "showering sparks and a godless glare " onto Hamburg, Paris and by the 1870's several American and Mediterranean cities.

The earliest electric systems were carbon arc, which produces a blue-white light of high intensity. The most efficient air-arc lamps are large ones. The limits of the technology seemed to have produced some startling results. Los Angeles had several 120 foot tall steel towers, complete with winches and attendant's platforms strategically placed around the commercial district. Six arc systems lit over half a square mile "to an intensity that allowed one to read a newspaper without difficulty on the darkest night"¹⁴.

¹⁴The Art of Street Lighting in Los Angeles; Eddy S. Feldman, Dawson Book Shop, Los Angeles, 1974. pg. 36.

AEG, a large manufacture of electric lighting equipment in Germany and throughout Europe during the latter part of the 19th century, offered systems that included carbon rods containing metallic salts that could alter the color of the light produced.

Gas still supplemented most arc light systems until the 1890's when incadescent lamps became rugged enough for extended all weather use. By the 1920's all major remote lighting technology had developed. Gas discharge lamps, mercury vapor, sodium and neon all were available and used in extensive area illumination systems. The Ford Motor Company River Rouge plant used modern (circa 1919) planned lighting, broad open interior spaces with lamps silvered on the crown of the globe, reflecting the filament to a white porcelain enamel shade that dispersed the light over large areas of the interior. Until remote electric systems, few light sources were bright enough to require shading. Industrial and security lighting made extensive use of technologically advanced systems such as mercury and sodium vapor. In the late 1940's and early 1950's the Phillips Company of Eindhoven, Netherlands, began extensive work with short arc lamps, taking advantage of what can be an objectionable characteristic of metal arc lamps, their limited visible wavelength output. High pressure mercury vapor arc lamps irradiate visible light in blue-green with little long wave (yellow-orange) output. Sodium lamps produce long wave

visible light. Through extensive installations on highways in Holland and Germany, Phillips developed and marketed a highway lighting system that took advantage of this physical aspect of the metal arc lamps. Long stretches of highway were illuminated with sodium lamps and intersections and off ramps, any road interchange, were carefully contrasted, allowed to fall out, in the shorter and to the human eye dimmer blue-green mercury lamps.¹⁵

Controlled atmosphere arc lamps provide limitless 'kinds' of light. Ion lasers, helium-neon, argon, krypton and mixed gas types are used in imaging and illumination systems with extremely narrow wavelength outputs. Neon advertising tubing and fluorescent area lighting use mercury and argon as well as other rare gases to produce a broad pallet of color. Fluorescent lighting uses low pressure mercury vapor ultra-violet to drive phosphors formulated to simulate true color.

A virtual quarry of palpable light is at hand in the late twentieth century. The apparently limitless amount of energy produced has afforded the development of physically potent artificial light. Light that can be used to manage our moods and keep us off the streets. Robert Louis Stevenson's nightmare come true, there is no more true night in the industrially developed world.

¹⁵Road Lighting; Ir. W.J.M. van Bommel, Prof. J.B. de Boer, Phillips Technical Library, Kluwer Technische Boeken B.V.-Deventer-Antwerpen, 1980. pp227-265.

The skin of three dimensionality is light. Since the beginning of the western tradition of individuated artists\makers light has been a consideration along with mass and surface in proclaiming the presence of the object. From the earliest extant koros of the island of Naxos shadow reveals mass with light. The consideration of light is present, but until the twentieth century an artist could only use light as a passive partner. Light can serve to detail the site of a work. North Africa and Egypt use broad planes stepping down into the substance of work. The sculptor working in the broad long light of the southern Mediterranean broadened the vowels of the vision in the object. The strong deep light could not wash out the body of the work at noon time. The long sun dying quickly gave a hint of life to the broad planned mass. The light lengthens and lingers further north, in Greece sharp white and also changing throughout the year, more rain means hide the great work from nature's chisel. High above the Parthenon's entry minor gods fight their own oblivion, now trapped in far north light, endlessly dying in the British Museum's pale cool flat blue light. Real Greek work was meant to work in the stark short summer as well as long autumn and dim rainy winter glow elusively in each light, recording their very presence on earth. Perhaps some future true connoisseur of light could extrapolate the place and time of making for each sculpted object by how

light brings it alive.

Perhaps the light of evening in central France reflected and absorbed by stones quarried in the 11th century gave some clue to Claude Monet that light is a presence that can be affected in work by each artist. His series of paintings took two years to complete, admittedly he could work on each one only twenty minutes each day. The paintings are able to evoke the presence of time through light reflected even now from the incandescent light in contemporary galleries the facade of the Rouen Cathedral at 4:30 in the afternoon. The puzzle of reflected and absorbed light is great, perhaps lost in art criticism and plane field physics, but the realization of time and place on the image field of a single painting is immense.

The physical presence of a painting is simple in appearance. A vertical plane carefully layered with emulsions of light reflecting and absorbing materials. Ideally, the vehicle of the emulsion does not adversely affect the transmission of external light to this color media, the pigment. Giotto used fresco, at least his surviving work is most brilliant in fresco, a term that refers to painting into wet plaster, to create a reflective surface of calcite and color. The Flemish painters searched for oils that dried clear, yet remained viscous long enough to allow them to complete the elaborate layering methods they used to imbue their paintings with inner radiance derived some say

from long northern reflected light. Surface color is a matter of reflection and absorption. The skin of the thingness of an object. Somehow a brilliant painting derives its fire and color from its thingness as well as its own will driven by light. Will of the object driven by light. The transcendent beingness of the object, the painting, all color and surface, is driven by light. Perhaps a photograph is driven by light? It is after all a light drawing. As is a diezo print and as well a hologram, perhaps the first true record of drawing with light. A painting is not a light drawing, it is an object meant to affect reflected light. It presents visually relevant information only incidentally to its true message of light, color and presence.

The work of painters seems to be concerned with releasing light at the surface of the color field. The work of sculptors would then be to reveal light in mass. Light is of concern in painting, texture and surface collaborators with light in revealing content. Sculpture can work without light. Indeed without mass, if by mass we mean a physical object that can be hefted and moved about. We can read the object with touch, determine texture, broad field and even mass. Field and mass (volume) can also be established with sound. Sound adds hints to movement with light and mass. Sound alone can create mass in the mind. Light alone with mind and eye can be volume, shape and mass.

By the beginning of the twentieth century painters and

sculptors had begun to push the limits of conventional visual representation. Using subject matter for the most part familiar to themselves as well as their patrons and critics, Monet, Pissaro, Van Gogh and other painters working in western traditions and materials began to manipulate the visual output of their canvases. Their use of color and texture at the surface of the picture plane affected how light came off the canvas. Van Gogh used paint straight from the tube in lush sometimes swirling strokes, compositionally guiding the eye through his color maze. Seurat's raster scan of image with precisely mixed points of color applied in proximities that make the eye and mind build new colors and light that are not on the canvas.

A transparent canvas or mutable block of stone would let light into the work and release the artist from constantly fumbling with reflection and transformation. Marcel Duchamp's large glass, *The Bride Stripped Bare by Her Bachelor, Even*, is not the first painting on glass, but perhaps the first to invite a visitation of light on subject.¹⁶ The image is a stylized chocolate mill, drawn

¹⁶Theories of Modern Art; Herschel B. Chip, editor, University of California Press, Berkeley, Los Angeles, 1968. pg. 392 The basis of my own work during the years just before coming to America in 1915 was a desire to break up forms--to "decompose" them along the lines the cubists had done. But I wanted to go further--much further--in fact in quite another direction altogether. This was what resulted in *Nude Descending a Staircase*, and eventually led to my large glass, *La Mariee mise a nu par ses celibataires, meme [The Bride Stripped Bare by Her Bachelors, Even.]*

with precision on a large plate of glass, now backed with wire reinforced glass, set in a metal frame. The work, is hung away from the wall, allowing the viewer free access to both sides of the image. Naum Gabo projected planes into the mass of light and structure and allowed one plane to be transparent. He structured work with transparent screens of plastic and wire; postulated structures of light. Gabo's extensive background in science allowed him direct access to Einstein and Vasiliev's mathematical renderings of space and time. "Color is illusory and is renounced in favor of natural tone. Line must not serve a descriptive function, but rather, act as a delineator of forces and rhythm. Depth, rather than volume, is asserted as the only 'pictorial and plastic form of space.' Mass is renounced as a sculptural element: strength and form do not depend upon mass."¹⁷ His literary and sculptural visions of time, light and space were transformed into plexiglas and celluloid models.

Schlimmer's use of light in theatre and dance, especially in defining the human figure draw on the twentieth century technology of remotely fired light sources. Thomas Wilfred spent a life time manipulating projections of incandescent filaments onto and into architectural spaces. The light movement defined the time and placement of each

¹⁷Naum Gabo, *Sixty Years of Constructivism*; edited by Steven A. Nash and Jorn Merkert. Prestel-Verlag, Munich, 1985. pg.25. This is a paraphrase of a portion of the *Realistic Manifesto* signed by Gabo and his brother Antoine Pevsner, in 1920.

light composition. Wilfred's most ambitious works filled lobbies of major buildings with murals of light. Never realized were building sized light sculptures intended as termination pieces for 'skyscrapers'. The Clavilux Silent Visual Carillon was intended as a giant light organ, displaying a slowly changing sonata in light. Whether by bad luck or cruel fate, the light work most remembered from Wilfred's era is Albert Speer's endless columns of light at Nuremberg.

Any artist working, given free reign, chooses the material best fitted for the expressed need. The twentieth century has been a watershed of material as well as a morass waiting to ensnare those unwilling to be critical of the stuff of and results of their art. As reflected light drives visual work, remotely fired and manipulated light becomes work in itself. Dan Flavin, defined as minimalist artist by mid century critics, uses unmodified fluorescent fixtures. Flavin denies any connection between the artifact of his work, the commercial light sources he uses, and the outcome of his work, the lighted space. This is not so very far from Moholy-Nagy *Light-Space Modulator*. Intended as a device to modify and construct the light directed at it, the shadows and reflections cast recorded on film. The film was then projected into a performance space. Hirschfield-Mack's work with projected color and multiple image layering on translucent screens seem to foreshadow holographic images.

Using simple apparatus he composed light and sound compositions dependent on the shadowing of sources and interdiction of colored filters. His notes indicated a rather dignified lack of technology rather than any attempt to add sophistication to his light performances.^{1A}

Lucio Fontana, an Argentine artist who has used most all traditional media at some time in his large oeuvre, made a startling and consistent statement with light at the 31st Milan Fair in 1953. Fontana had an aluminum ceiling suspended in the lobby of the Sidercomit Pavilion. Neon tubes were hung through holes in the metal, no attempt made to hide the necessary wiring. All other illumination in the space was removed. Taken in the context of his work at that time, the light piece forshadows the slit canvases but follows well the time and space of his wire and stone work. Fontana effectively used light as if it were bronze or stone or paint.

Flavin's work with specific sources of light, removing the obligatory technological baggage necessary for light performance, frees Flavin to define his space with light. The aritifact is negligible, perhaps to the Bauhaus workers

^{1A}Beyond Modern Sculpture; Jack Burnham, George Braziller, New York, 1987. pg.290. Painting Photography Film; Laszlo Moholy-Nagy, MIT Press, Cambridge, a reprint of an original text. These two books contain complimentary descriptions of Laszlo's and Hirschfield's work. The descriptions of process and image are derived from these sources and a small book Abstract Film and Beyond, by Malcolm Le Grice, MIT Press, 1981, in which the author describes and illustrates segments from Laszlo's films.

the mechanisms of their projections had similiar physical value. The device only produces the light. The less interaction the better. Do we make note of lamp cords or ceiling lights? They appear when they do not function. We look for the light when it fails to follow the flick of the wall switch. In art light must be much like paint or marble or bronze. Not so much an engine of change or supernatural representation, but a formidable presence, palpable in its' strength and delineating time and space.

The physical presence of light is most obvious when a single wavelength source dominates an environment or delineated space. Individual reactions to monochromatic light range from indifference to hostility. Defining the space illuminated specifically as a work of art can be construed by some individuals as a personal insult.

Artist working in light use two methods. They manipulate sources of light to generate projected images. They define or imply volume with radiant light sources. All contemporary work falls into one of these two categories. Programed light works, whether using laser projectors driven by sophisticated computer operated systems, an individual manipulating a flexible mirror reflecting the rays of the sun onto the side of a building or a light beam interrupted by a transparent serial image (motion picture), all expect or at least assume that there is a performance of a measurable duration and an audience. Light structures, on the other hand, tend to be somewhat static. Ranging in subtlety from the placement of walls and planes affecting the shadow and path of daylight, to the positioning and manipulation of light sources within and exclusive of architectural limitations. This last mentioned kind of light work has been the inspiration of my own work.

The structure and use of light with mass has been an active aspect of all sculpture. In my own work it was soon evident that light was the driving force behind any three

dimensional rendering of a personal inner vision. Translating that thought to a palpable work of art became the directing force on my work. The structured light work needed to stand on its own merits within the context of industrial society. The materials of the works structure had to be drawn from the quarry of contemporary materiel. The inspiration for the works was and is for the most part derived from the use of powerful remotely fired light sources in industrial, urban and highway settings. Industrial light sources are developed to provide efficient, economical illumination of large spaces. Little regard is given to any but rudimentary sensitivity to color rendition or spatial distortion. The efficiency, in economic terms, of a light source is determined by how much of the energy the source consumes is translated into visible light. The least efficient lamps, in these circumstances, are incandescent [filament] sources; the most efficient single wavelength or nearly mono-color output metal arc lamps. Economic efficiency and luminous efficacy [the ability of a lamp to generate visible balanced or full wave luminous light] are not necessarily self exclusive, but in the reality of modern times or industrial bureacracies (I don't really know which), metal arc lamps with narrow band visible output have come to the fore in supply houses and parking lots, expressways and city streets.

The red-orange light common to city streets is typically

the result of high pressure sodium arc lamps used as broad area luminars, whitish to blue-green light from mercury vapor and deep orange violet low pressure sodium-argon lamps. These industrial light sources are essentially narrow band visible light projectors. Used additively, these light sources can produce perceptual distortions of large scale environmental visual clues. Placing short wavelength sources beyond or beneath long wavelength sources 'tricks' the eye's color sense into 'seeing' the mercury source illuminated space fall out from the surrounding envelope of long wave sodium light. Over the past five years I have used these perceptually distinct characteristics of metal arc lamps to build structures in specific light.

The perceptual differences viewed by an individual entering a space lit with monochromatic light from the same individuals visual cues in full spectral light are profound. The first work using specific light that was the outcome of this perceptual insight was installed in a gallery at the Massachusetts College of Art. The piece, *Wave Front*, used the entire room. Twenty eight by sixty four feet, with a sixteen foot high arched ceiling the room had light colored stucco walls. I built a wall eight feet high and twelve feet out from the south wall of the gallery. I then built a six foot wall crossing the twelve foot wall and installed a mercury vapor security fixture on the top of this wall at one end and a sodium vapor fixture at the other. An arch of

galvanized steel panels was then placed against the short wall between the metal arc luminars. These reflected and diffused the light from each lamp as they mixed in the center of the room. One end of the room was now lit by the mercury vapor lamp, the other by the sodium lamp. Entering the gallery from either end, the first effect was of the light that immediately faced and surrounded you, then an awareness that another kind or color of light hovered above and behind the light that defined the immediate space. The other side of the room, the opposite entry, reversed the apparent light and color play. As one passed through the space, the light enveloped changed over from one source to the other and altered the perceived depth and closeness of the gallery. There was always 'enough' light in the room. The available lumens was well above the norm for open indoor space. But the kind of light, light of specific wavelength and characteristics, made the eye and mind change the space, change the room. The eye even seemed to go looking for the missing light.

Wave Front was the first piece with structured light, meant to alter a perceived or experienced space. A collaborative work with students from CAVS\MIT at building W-11 in 1985 with video light, incandescent and candle illumination followed. This work drew on the atmospheric of light more than the physical structure of light. In the CAVS piece, slit aperture projectors were placed over low wattage

incandescent lamps, projecting elongated images of the filaments into the space. The radiant glow from the light rays mixed with the glow from the video screens, the video image hidden behind scrim, to form pools and lines of light on the floor and moving up into the space of the room.

These pieces led to the first exterior work, an installation at first night, *Light Steps*, using sodium and mercury lamps arranged in exclusive rings. Five eight foot tall galvanized steel reflectors faced out from a twenty foot in diameter circle of fourteen foot high reflectors carrying ten mercury vapor lamps. The structure became an envelope of light, the interior strong blue-green mercury vapor, the outside a ring of orange yellow sodium light. *Light Steps* was a site piece meant for short duration and heavy use. At least 12,000 people entered the space and moved through the piece in the six hours it was up and running.

Another piece, this one with dancers, a string quartet and interactive video used a more sophisticated version of the slit aperture projectors. Designed as a stage set for the ballet, *Refrigerator*, by composer Gamma Skupinsky, it was performed in Jordan Hall at the New England Conservatory of Music in May, 1986. The projectors were driven by clear envelope mercury and sodium lamps. Each projector was eight feet tall and stood on the stage with the performers. They projected distinct rays of blue-green and orange-yellow narrow band light. These light pieces along with the video

projector provided the only illumination on the stage throughout the performance. As the dancers passed through each light beam their individual shadows were projected onto the back of the stage and silhouetted in complimentary (the opposite color wavelength) toward the audience. The dancers altered the design and perception of their space as they passed through and interacted with the light that defined the stage.

These works led to a number of commercial works, works designed and built for direct use on a continuous basis. The works ranged in size somewhat, but remained on a human scale (no light source more than eight feet high). All were meant to work interactively with ambient urban light. Each defined a space with the specific light source involved in the work. *Light Line* was built under a rather subdued conventional back lit plastic sign. Fifteen feet long, one and a half feet high and one foot deep, it is driven by eight clear jacket (unphosphored) mercury vapor lamps. The mercury vapor light washes a brick wall, with little spill to the side walk. The shadows in the mortar joints between the bricks are picked out by the extremely powerful street sodium vapor street lights. As you walk by the piece, you see a change in the perceived color of the pavement and wall. Close to the wall, the individual bricks seem to float off the wall as the contrasting wavelengths emitted by the mercury and sodium lamps interact. Another piece is installed under an awning

over a restaurant's exterior windows and entry way. The short wave mercury light picks out the restaurant's space or site from the overall sodium glow of Boston night. Again, the contrast between the two light sources and the overlapping interactive area changes and then picks out aspects of personal perception in space.

I have continued to refine and manipulate both temporary and permanent site installations through my time at MIT. I have also begun to include physical divisions between the light sources. The first of these pieces used holographic images on 11x14 acetate film substrate to alter the quality of light emitted by a small quartz-halogen incandescent lamp. Quartz-halogen lamps depend on a high temperature and extremely bright filament to give near full wave visible illumination. I built fixtures that illuminated the holograms from directly below the sculpture that carried the film substrate. Because of the low incident angle and bright near point source, the apparent color of the holographic image changed as you approached it. The works were arranged in the gallery in such a way that each hologram revealed itself as the other fell out (the observer was so far off the first order image, that there no longer was a visible image or projected light). The hologram literally bent and altered the spectral mix of a portion of the quartz lamp, altering the light level and the characteristics of the light in the room.

A severe limitation of holograms is the instability of the images as well as the inability of the substrate material to survive in the open air, inclement weather or air pollution. In an attempt to at least use some portion of the effect that the hologram has on light (as a wave guide, selectively refracting specific wavelengths) I began experimenting with a number of different materials. After working with a number of plastics, notably large fresnel lenses and diffraction screens, I rejected plastics for the same reason I had originally found holograms wanting; lack of durability. This led to experimentation with different sorts of fabrics. The material has to be somewhat durable as well as translucent, reflecting some light and transmitting the rest. A true test of the material would be an installation in a setting with ambient light opposite of the intended driven or chosen light source. These criteria then began to define my thesis project.

After wandering around campus for a while, I settled on the front of building W-11. There were strong sodium vapor street lights surrounding the site, leaving the area of the installation in relative shadow. A dark low wall protecting a basement stairway provided a logical place for a contrasting light source, a 400 watt clear jacketed mercury vapor street luminar. The scrim, a silver translucent fabric, seems to trap the mercury vapor light against the building, letting it out above and below the line of the

fabric. The long wave sodium light reflects off the metallic sheen of the plane of the fabric and seems to hang in the air independent of the surroundings. During the day the sun and wind interact with the fabric, altering the apparent facade of the building. The mercury lamp runs day and night, maintaining its presence in shadow, even working with the rain during the day.

With simple and very direct means and the addition of one light source, the apparent structure and presence of the building is changed. Interactive light from specific sources has a powerful and direct effect on mass and form. The presence of this work is defined by the ambient light and its direct interaction with another and complimentary specific light source. The screen acts as a point of interaction, the plane of effect as it were. The piece works because there is no obvious light source, just what appears to there, part of the immediate environment.

I think of this work as a point of departure. It is not the end of a series of experiments in perception and light, but a beginning of works that define the plane of interaction of specific kinds of light. This piece is the cleft between two lights and a moment in time.

APPENDIX

Text of thesis project

Illustrations

Developmental drawings for thesis project
in order of development of concept.

- a) preliminary site concept
- b) further work
- c) final form of work

Drawings for other projects

- d) preliminary drawing for Clear
Rays
- e) ground plan for Clear Lights

Electrostatic copies of photographs

- a) Wave Front
- b) Stage set for ballet
"Refrigerator"
- c) Clear Lights

THESIS PROJECT

I believe the point of this project should be to produce an integrated work of art rather than a demonstration piece. My time at the Center has been spent, for the most part, involved with resolving questions of integration of form and material in specific works of art. I have sharpened my awareness of techniques more than introduced new ones to my work. With this in mind the piece I envision would use a number of apparently disparate materials and techniques in juxtaposition with a specific site, to produce a unique work of art that delimits itself and transforms its site. In other words I will use the play of light and shadow in a situation given over to the production of a work of art.

I have two sites in mind. Site one is the solar house site. Site two is the Center garden. The solar house site is isolated off the main campus near the athletic field. There is little free space available around the site and control of ambient light is minimal. These restrictions present more of a challenge than threat to the proposed work, but lack of security at the site and next to no interest and support from the people involved with the solar house coupled with logistical questions do point up negative considerations. The Center garden has next to no ambient light and a very real lack of space, but it is a relatively secure site. Logistical problems are minimal and the nature of the

building presents some compositional challenges. However by contrast to the solar house site, where almost anything one does would either go unnoticed or be at most unwelcome, the Center garden site presents real potential for disaster. The unique design of the Center building and its relative isolation from the campus imply that anything done to the exterior of the building will accentuate the orphan like vulnerability of the structure. When I lit the exterior of the Center for the 20th Anniversary I became aware of some of the characteristics of the building that make it difficult if not impossible to "apply" a work of art .

The somber color, while not menacing nor institutional in character as other small campus buildings are (the barracks or the old psychology office), unifies the building and presents a relatively impenetrable facade. The only niche available is either the stairway from the basement or the small garden area just to the left of the stairs as you face the Amherst Street facade'. This is the area I have named the Center garden. I am going to begin documenting both sites (the solar house and the Center garden) this week and plan to do some preliminary work on both sites. But the site which I think presents the greatest challenge is the Center site and it is there where I would like to present my work.

The nature of my thesis work has remained substantially the same since I began this document. The actualization is beginning to take form. The original work would have added a limestone column to one side of the grate in the garden area

and a steel mesh column of similar proportion to the other side. These vertical elements would have played off each other through the day in shadow and mass. In the evening a mercury vapor lamp at the base of the mesh column would contrast sharply with the ambient sodium vapor light from Mass. Ave. Now, I have decided on two rather significant changes. One, replace the mesh column with a young Lombardi poplar tree, significant to me because of its association with southwest Idaho; two, bring the back wall visually forward by installing an angle iron frame, painted gray, even with the short wall surrounding the stair. Then insert mesh panels in the frame. The frame and panels would not go to the sidewalk. They would stop at the wall height. The mercury vapor lamp would remain, now illuminating the tree and the mesh, providing a kind of shimmering light shield as people drove by. The incidental interference of the long and short wave radiation of the mercury and sodium light on the mesh (wire mesh, because it has a reflective metallic finish and dimensionality) sets up an illusion of floating mass. The tanbark will be removed or covered over with washed gravel, and I would re-install the center neon sign in the office window.

Over the past several weeks I have performed a number of experiments with my usual light sources, mercury and sodium vapor lamps. I placed a number of panels of different lengths and widths of the wire screen I propose using as a light catcher (galvanized steel lathing, a common building

product) at varying distances from the sources, simulating the conditions on the front of the Center Building. On the installation at the center, the mercury lamp will be over the basement stair, below street sight line to passers by and motorist. The opposing sodium light sources are ambient to the evening and night. From these investigations, I have come to the conclusion that the most dramatic effects on the space both day and night come from using mesh in long thin strips, hanging in a line above the curb between the sidewalk and the garden area. They would be suspended from a steel bar even with the top of the stucco wall (about ten feet from the ground), each would be approximately five feet long. I will need to adjust the absolute height on the site. What I have found with experimentation is that the long thin strips of wire mesh move with the wind, even from people walking by, changing shadow and reflection on the wall as well as altering perception of mass. The mercury vapor lamp will be controlled by a photo-electric device adjusted to turn the light on at dusk, reversing the normal darkening of the stair well at night. I believe these alterations of my original proposal for this piece incorporates a number of my basic concepts, i.e., the juxtaposition of opposing wave length light sources, the establishment of mass and volume with shadow and light and an interaction and alteration of time and natural light through the passive and environmentally based control of an artificial light source.

CLEAR RAYS

A PROPOSAL FOR FIRST NIGHT
1967

CLEAR RAYS IS A GROUP OF COLUMNS,
FILLED WITH ALTERNATE LONG AND
SHORT WAVELENGTH LIGHT. THE LIGHT
SOURCES ARE HIGH PRESSURE SODIUM AND
MERCURY BULBS.

THE RELATION BETWEEN THE WIDTH
OF THE GAP IN EACH COLUMN AND THE SIZE
OF THE LIGHT SOURCE (BULB FRAGMENT) PRODUCES
A VERY DISTINCT "RAY" OR BAND OF INTENSE
ICE BLUE OR GREENISH ORANGE LIGHT.

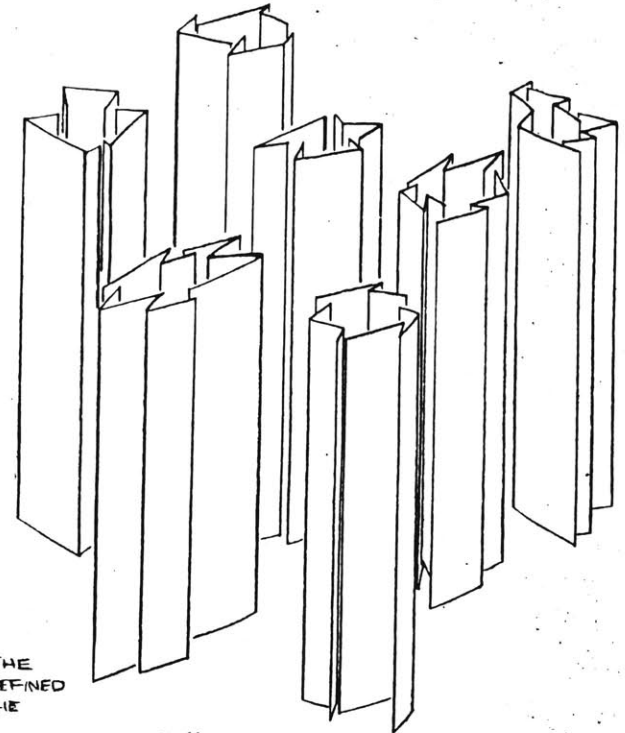
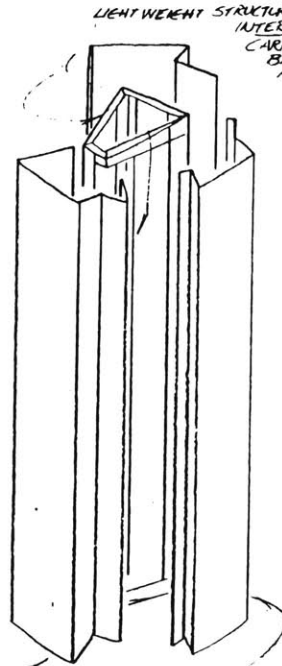
INCLUDED IN MY SLIDES ARE SCENES FROM
A BALLET PERFORMED AT NJC - THE RAYS ON THE
STAGE WERE GENERATED BY PROJECTORS SIMILAR TO
THESE - THE ICE BLUE OF THE FUTURE - SWEEPS
THE FLOW OF SETTING SUN - ORANGE.

THE INTENSITY OF THE LIGHT IS ENOUGH
TO DEAL WITH WASH FROM STREET AND SOME
SECURITY LIGHTING - A SEMI DARK TO DARK
AREA WOULD BE IDEAL - BIN WIT LOT AT
BERGLEY AND NEWBURY - OR OTHER
CONTAINED AREA.

SYMBOLISM - BLUE WHITE OF FUTURE -
WASHES ORANGE RED SHIFT OF
PAST TIME EVENTS -

WITH THE COOPERATION OF COMPOSER
SAMIA SKUPINSKY - A COMPOSITION "MERCURY"
A MUSICAL SONATA IN THREE PARTS WILL
BE PERFORMED IN THE PIECE - FIVE PERFORMANCES
OF 10-15 MINUTE DURATION - AT 6:11 ALL TIMES
THE PUBLIC WILL BE FREE TO PASS THRU
THE PIECE AND "ENJOY THE LIGHTS"

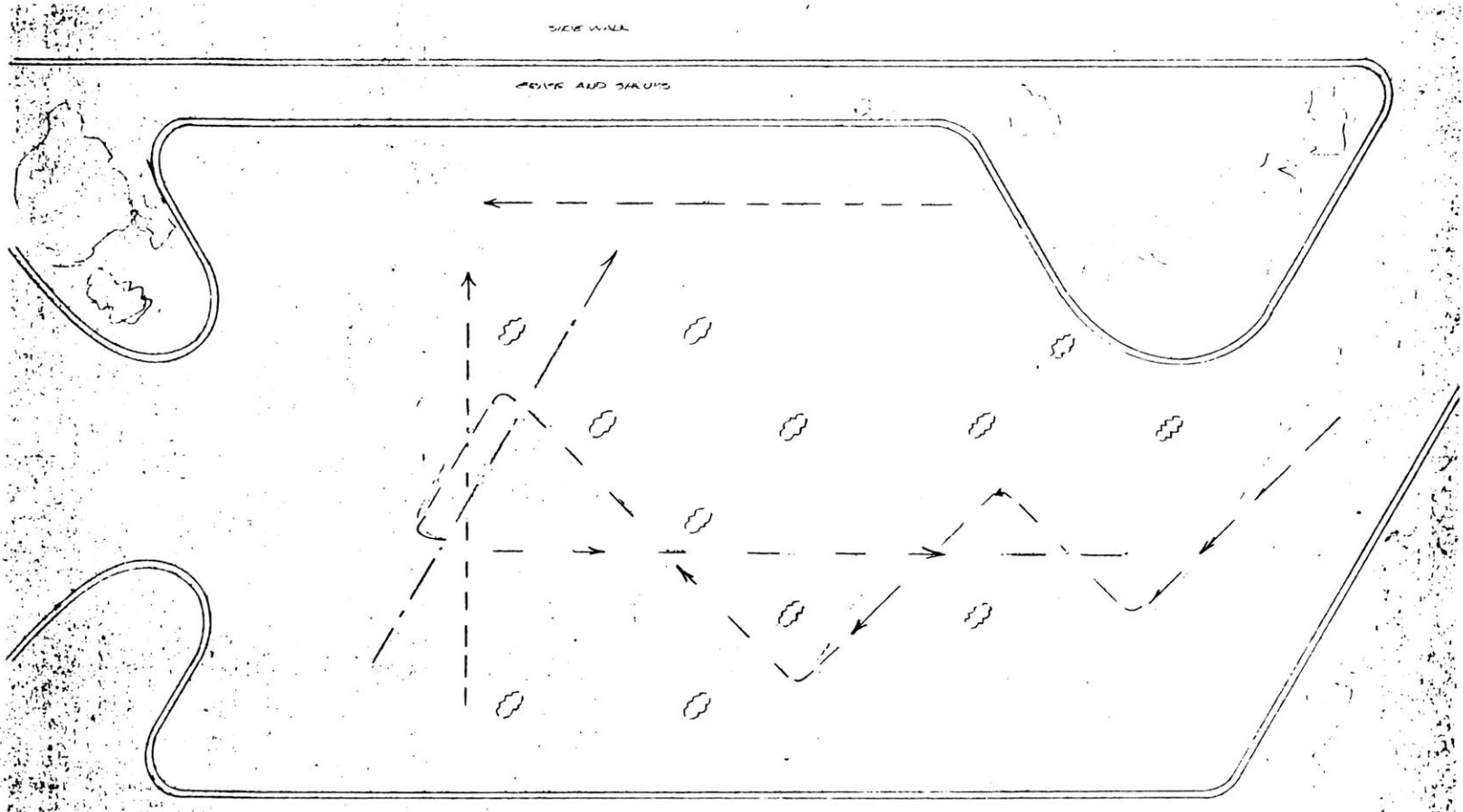
| BUDGET | |
|---|----------------|
| FABRICATION (COLUMNS) PARTS | 595.00 |
| HPI - SODIUM AND BALLASTS (E) | 640.00 |
| MERCURY VAPOR AND BALLASTS (E) | 320.00 |
| ELECTRICAL HARDWARE | 245.00 |
| MUSICIANS - FOUR INSTRUMENTALISTS ONE SINGER | 250.00 |
| TOTAL | 2050.00 |



SIX TO EIGHT TEN
FOOT COLUMNS - IN
THREE GROUPS - THE
SPACE BETWEEN DEFINED
BY THE LIGHT OF THE
COLUMNS.

TYPICAL
COLUMN
ARRAY

VELL,
51 ST ST
[ADDRESS] 774K-
2710117

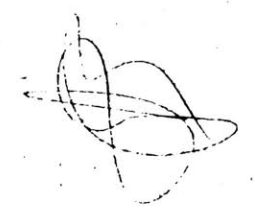


CONVIT/TELLER SIDE

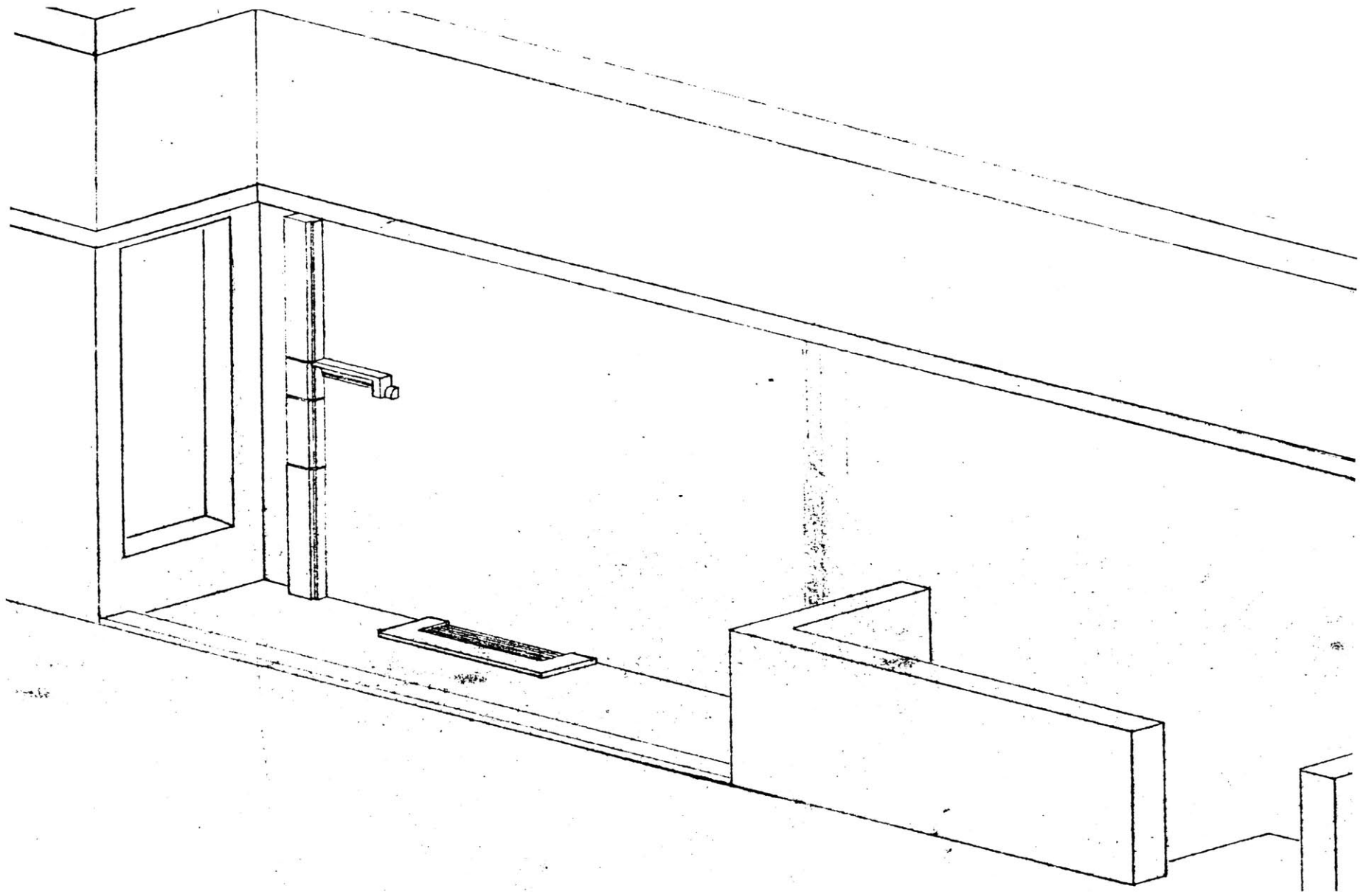
MUSLIM
MUSLIM

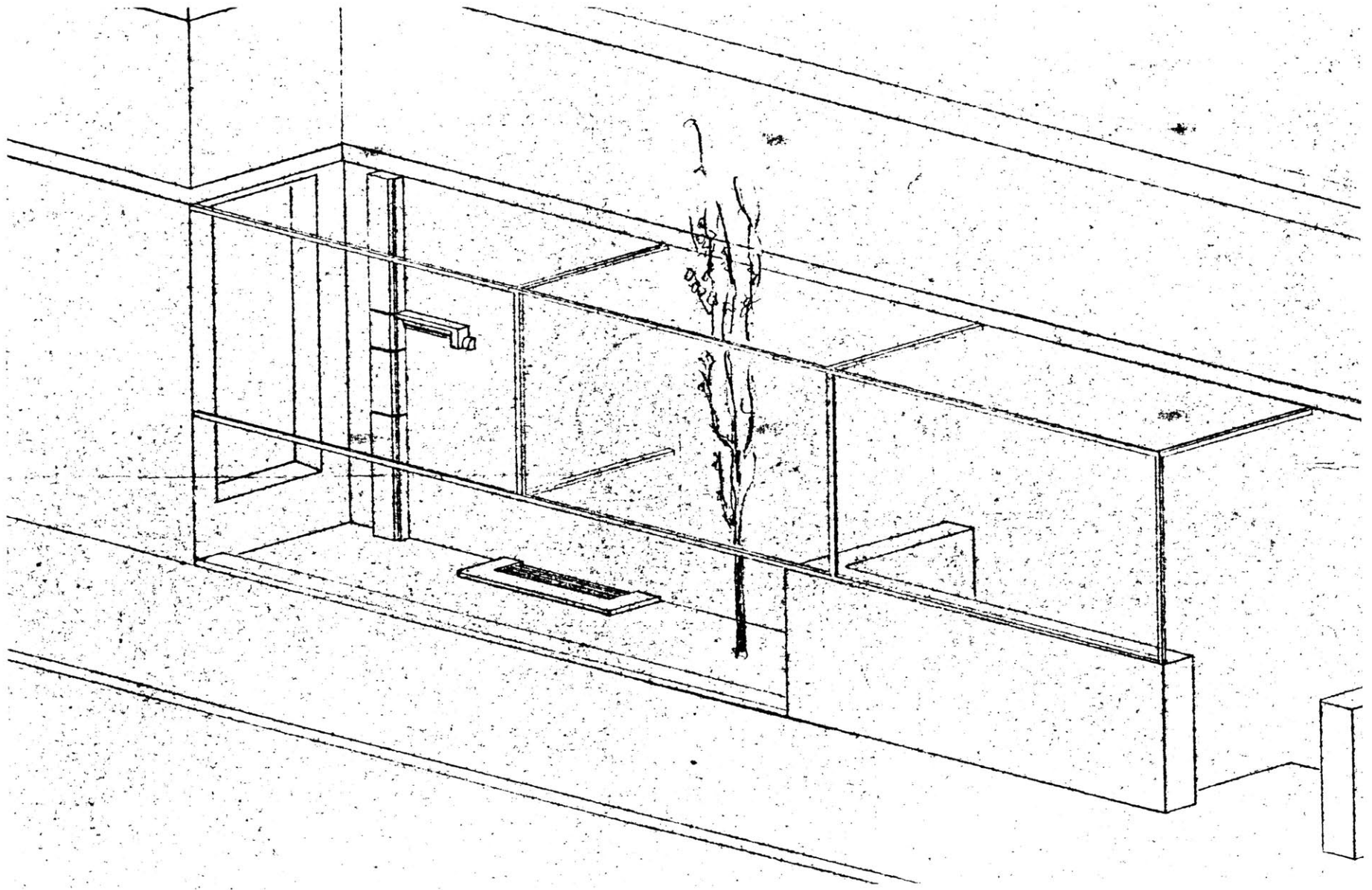
— SHAWARIS
— TURKISH
— SAVANNAH

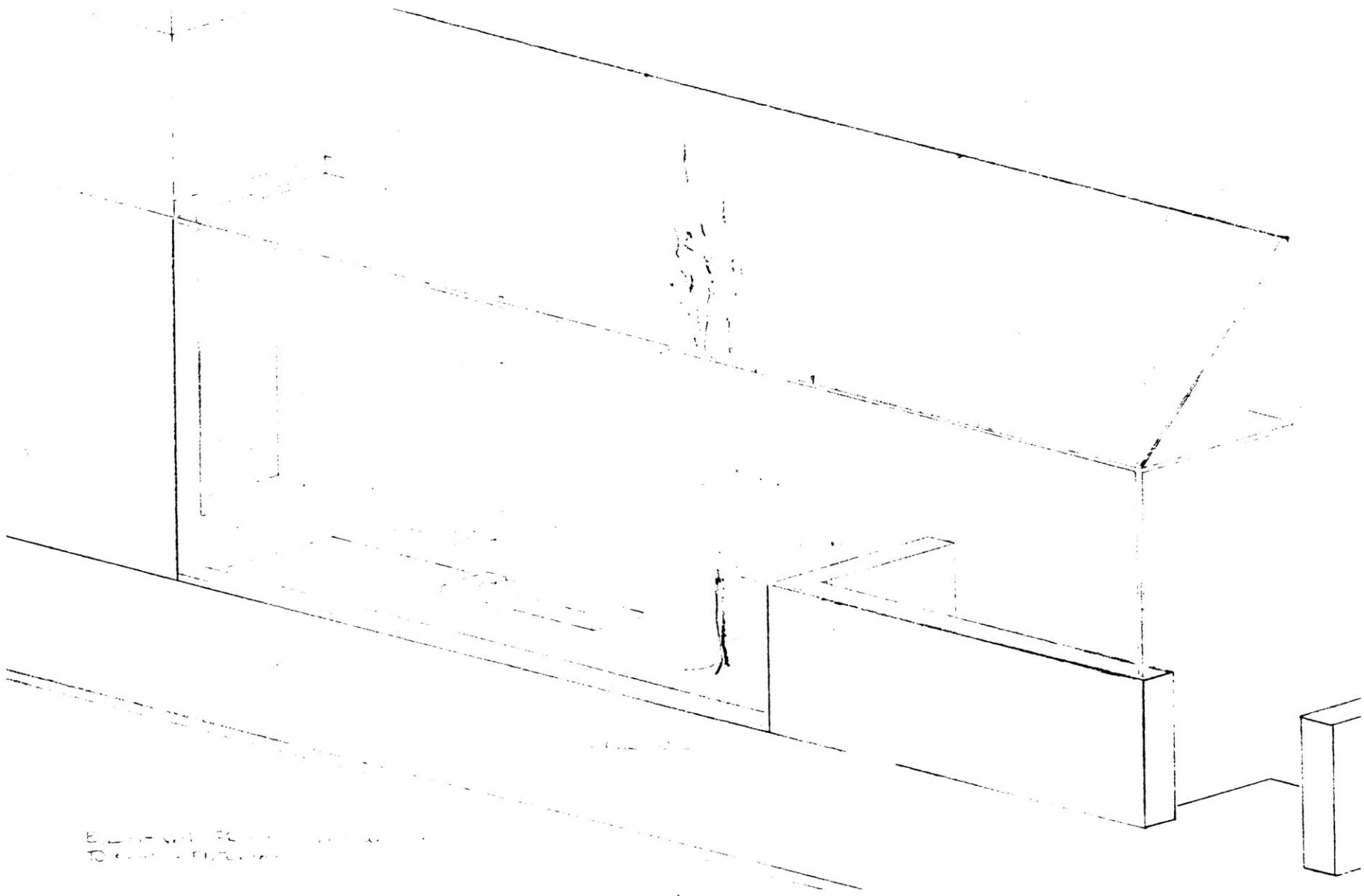
LIGHT COLUMN
8' TALL



CLEAR LIGHTS
FIXED LIGHT PROJECT
POST
1/2" - 1"
NOT APPROX. SEATS







10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.



