Architecture of Uncertainty

by

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ABSTRACT

Machines have been used throughout history as an extension of the human body; a prosthetic device that can provide the opportunity to redefine the spatial experience of a given time and place. In this investigation the Pinhole camera was used as a device for capturing photographic images of an urban place. The images produced by the pinhole cameras are representations of the existing place and its experience. The representation of a place generated by the device mediates the relationship between the body and the landscape. This thesis explores the production of architectural form with respect to the uncertainties of our built environment, strategies of representation, and the construction of urban devices that re-define the spatial experience.

Thesis Supervisor: J. Meejin Yoon

Title: Associate Professor of Architecture

Cities and buildings provide for our every living moment. Within them we dwell, work, take pleasure: cities are our spatial world. But too often we are purely passive users of these everyday spaces and structures, adapting our activities and movements to that which has already been designed. Through direct instructions (keep left, don't walk, no cyclists) or indirect conventions (this is the living room, the bathroom, here is where you sleep) we are informed as to what activites should take place in what spaces. And too often we do exactly what we are told.

Iain Borden, Strangely Familiar: Narratives of Architecture in the City, p. 84

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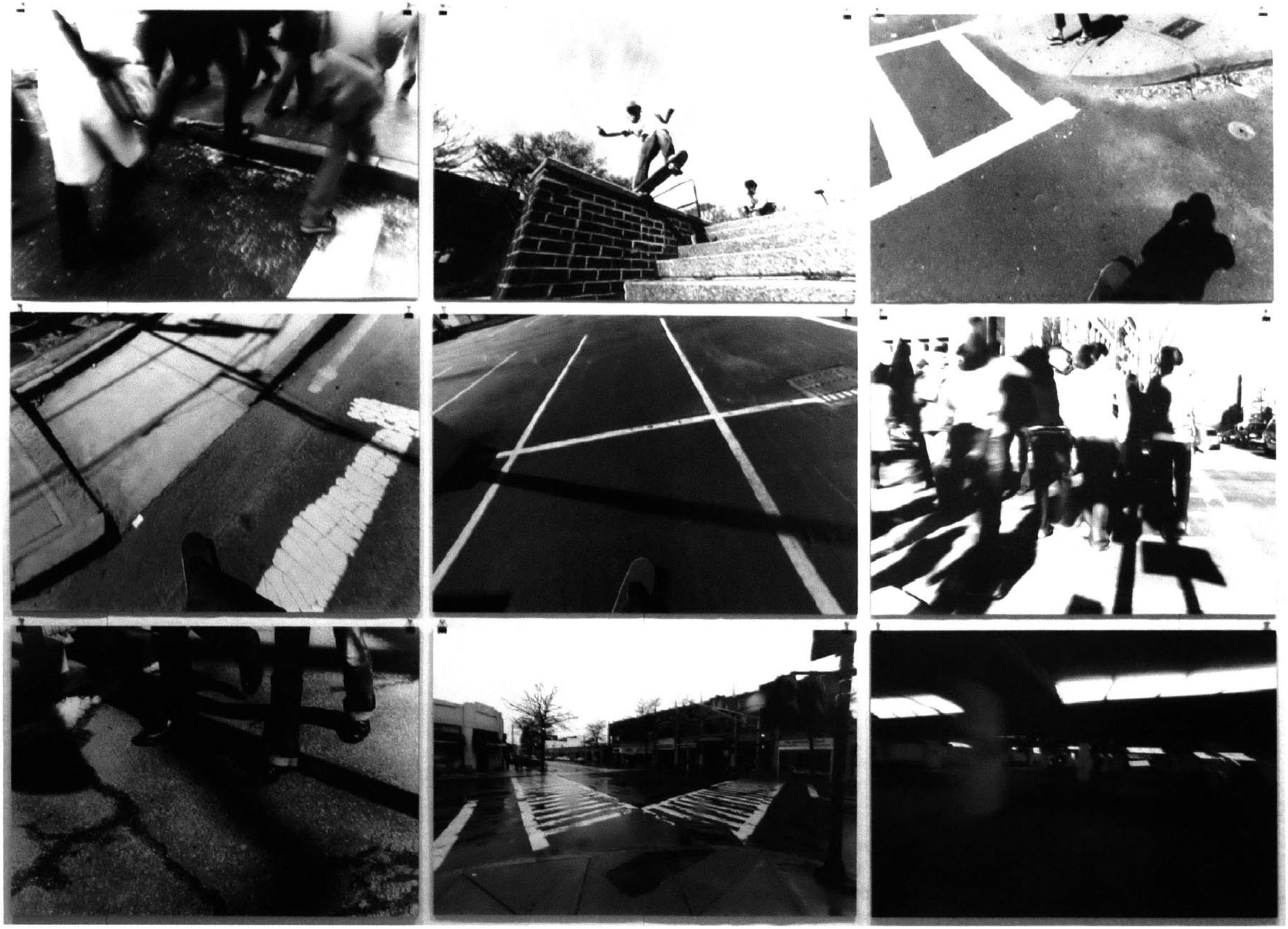
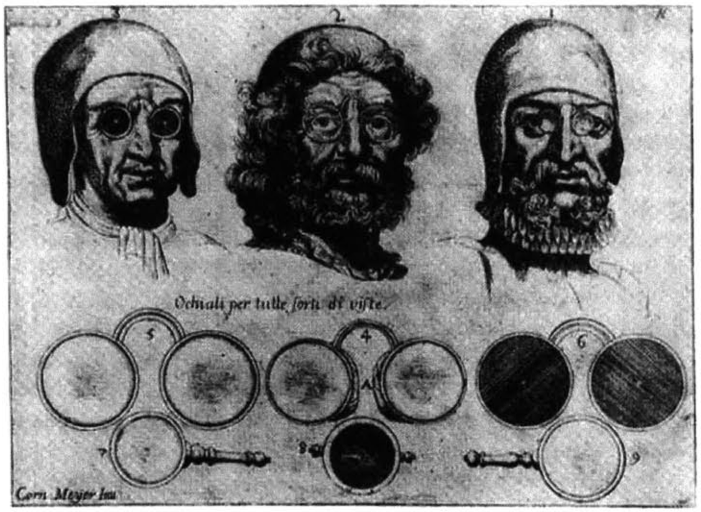
The DEVICE resolves the conflict between the body and the landscape, negotiating undomesticated space. Parking lots, cross walks, columns, grids, staircases and curbs are examples of the elements that define an urban landscape. The skateboard, as a device, intersects and interacts with these elements, redefining the urban experience of them.
Photography Installation, May, 2005.
(24 x 36" silver gelatin prints)



2. Artist Viewing through a Pinhole Fixed Eye Point in a perspective machine. Form Jacopo Barozzi di Vignola, *Le Due Regale della Prospettiva*, edited by Ignatio Danti, Rome, 1583. (Eric Renner, *Pinhole Photography*, p.xi)



3. Cornelius Meyer
Spectacles for All Manners of Sight.
From Gomar Wouters, 1689. (Renner p. 16)

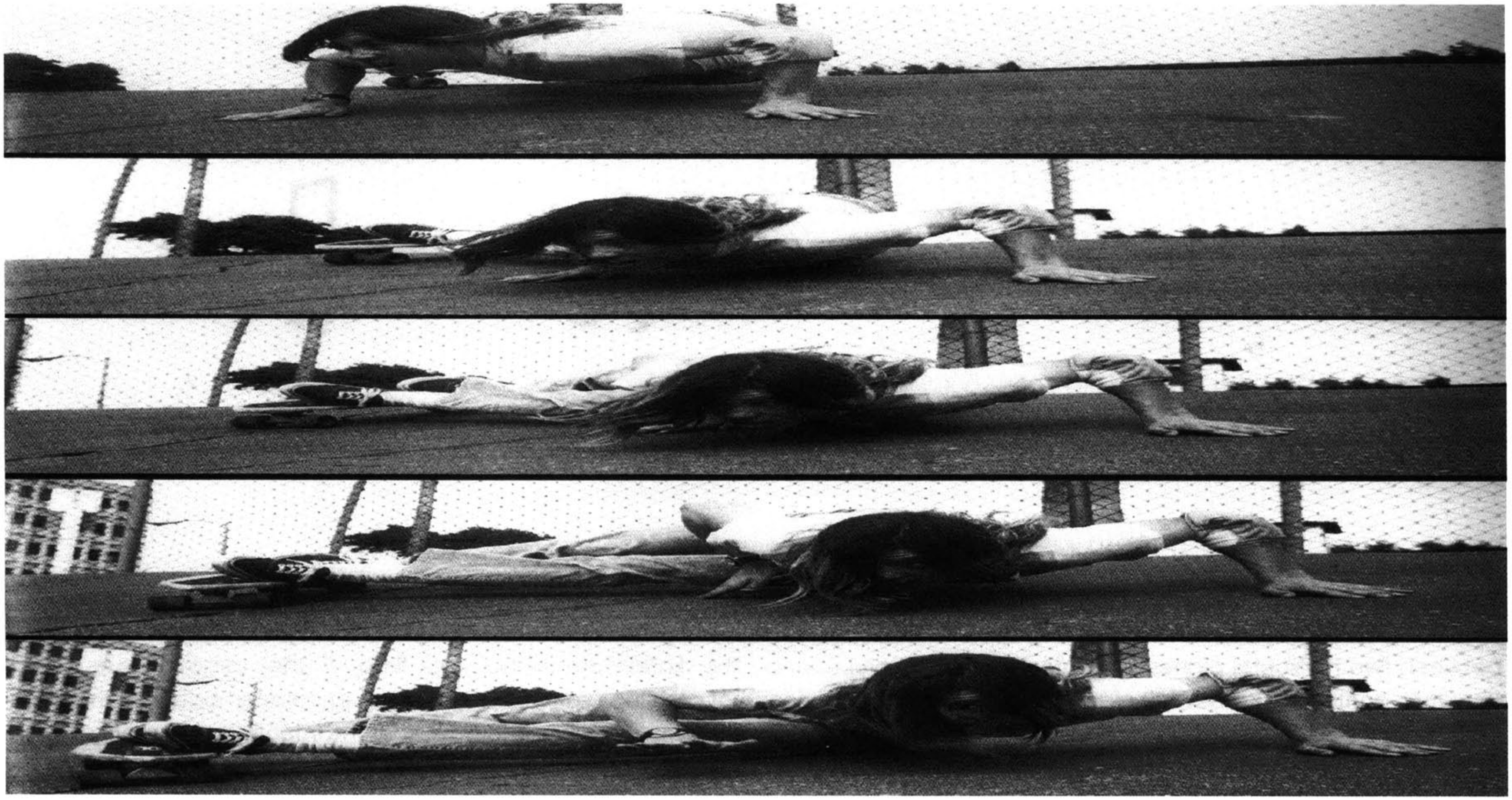
Machines have been used throughout history as an extension of the body, a prosthetic device that provided an opportunity to redefine the spatial experience of a place and time. This thesis used Pinhole camera devices as an instrument for capturing a photographic image of an urban place. Pinhole perspective devices have long been used for centuries in art. They provided early Renaissance artists like Leonardo Da Vinci, Leon Battista Alberti and Filippo Brunelleschi with a means for capturing reality in their paintings and drawings. Unlike early perspective devices using pinhole aperture techniques, modern day pinhole photography devices capture images that have less to do with "commonplace reality," than they do with showcasing the uncertainties of a place.

For this thesis investigation a series of Pinhole Camera devices were designed to re-evaluate and document an urban place. The resultant images were analyzed using strategies of representation which describe the uncertainty represented in the image. The thesis resulted in a series of transformative representations that evolved into a potential for an architecture that reveals the uncertainties of an urban place. The investigation was informed by an exploration of skateboarding and its methods of addressing the physicality of the urban landscape; utilizing the spaces and the objects found in the built environment. Similar to the skateboard, the pinhole camera mediates the relationship between the body and the urban landscape.


4, 5

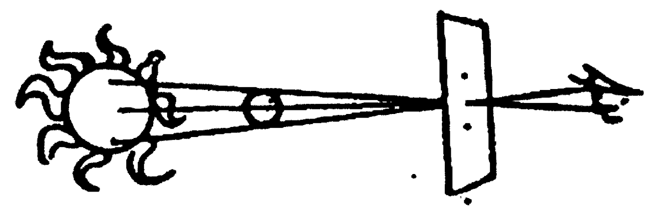
Using boards as an extension of their body, skateboarders engaged in the materiality of the appropriated spaces, listening for every surface change, feeling those changes, and reacting to them. They create a "sensuous geography" using the "phenomenal experience of architecture."[1] The relationship between body, board and surface is manipulated along with the spatial experience of the urban landscape. According to Henri Lefebvre, space, in itself, is defined as "infinite," it "has no shape in that it has no content." [2] Space is thus "assigned neither form, nor orientation, nor direction." [3] The skateboarder engages the urban landscape through the use of the skateboard and the body. In Kevin Ho's article *Skateboarding: An Interpretation of Space in the Olympic City*, "Skateboarders use their past experiences and their 'tool,' the skateboard, to interpret and utilize the spaces and objects of the environment that surround them." [4] The skateboarder forms a relationship with the concrete surface below the board. The surface texture of the concrete is transmitted through the wheels, trucks and deck of the board into the body. The skateboarder engages the terrain of the urban landscape through the use of the device, experiencing and reading the surrounding architecture of the modern city.

The skateboarder experiences the city as a set of objects which are encountered and interrogated. They view the city without maps using the opportunities presented by the physical topography of the city as a way of engaging with and reading the city. Architecture is seen as a potential opportunity for the skateboarder. They interrogate architecture in a different manner than that of the pedestrian or designer; understanding the city as a set of objects which are encountered such as ledges, walls, handrails, steps, benches curbs and concrete banks.



6. Body, Board and Device
Photo by Glen E. Friedman

Skateboarding began in the coastal towns of southern California in the 1950's and sixties. They were generally surfers who relied on the flat pavement when there were no waves along the coast. Throughout its history, skateboarders have treated the built environment like an ocean wave, "a massive cement playground of unlimited potential." [5] According to Iain Borden, "Space was found, appropriated and reconceived as another kind of space, as a concrete wave." [6] Surfing tricks would be recreated, trailing their hands along the surface of the pavement as if trailing the hand along the waters surface. The body operated the board as if it was a "floating mirror" scanning the "irregularities" of the surface, and "mapping the gently undulating contours." [7]



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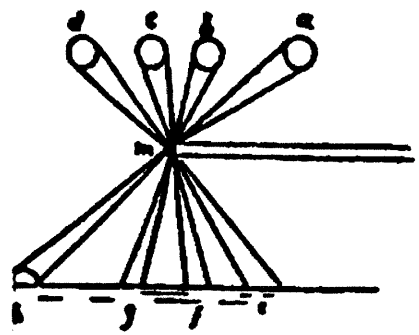
Skateboarders use the objects of the city in a manner isolated to a specific time and place. The objects become "'Launching pads' for one of an endless variety of tricks: jumping over a vertical boundary, sliding down a piece of angled metal, jumping down backwards between two horizontal planes separated vertically whilst spinning the skateboard at the same time." [8] They remove those objects from their contextual framework creating a "time-space experience of architecture which is a 'unique encounter' between the skateboarder, the device and the landscape." [9] The logic expressed by the urban skateboarder questions the intentions and motives of the pedestrian and designer. It is the skateboarder who appropriates the designed place, defining their own spatial logic while engaging the urban landscape.

I began this thesis with an investigation of the skateboard and its use in the modern city. Rather than explore the skateboard through design strategies, I decided to use design strategies to develop new devices (pinhole cameras) which evaluated the city through a method of representation. The designed pinhole cameras would vary in complexity from simple straightforward designs to more complex designs that resulted in multiple perspectives, shifting horizon lines and overlapping spaces, resulting in new visual experiences.

A Pinhole camera is a perspective imaging device which has been used for centuries in art. The pinhole device uses a small aperture, a pinhole, of a certain diameter. It had a dramatic change on the world's concept of space beginning in the 15th century.

Figure 7-9. Diagrams by Leonardo Da Vinci demonstrating principles of the camera obscura and the use of the aperture.



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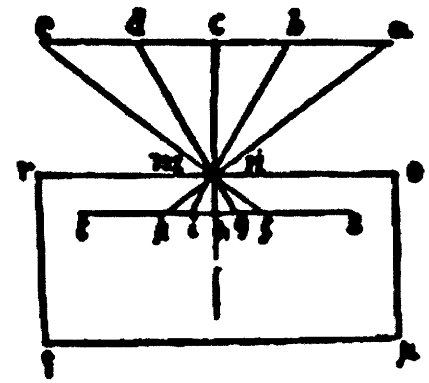

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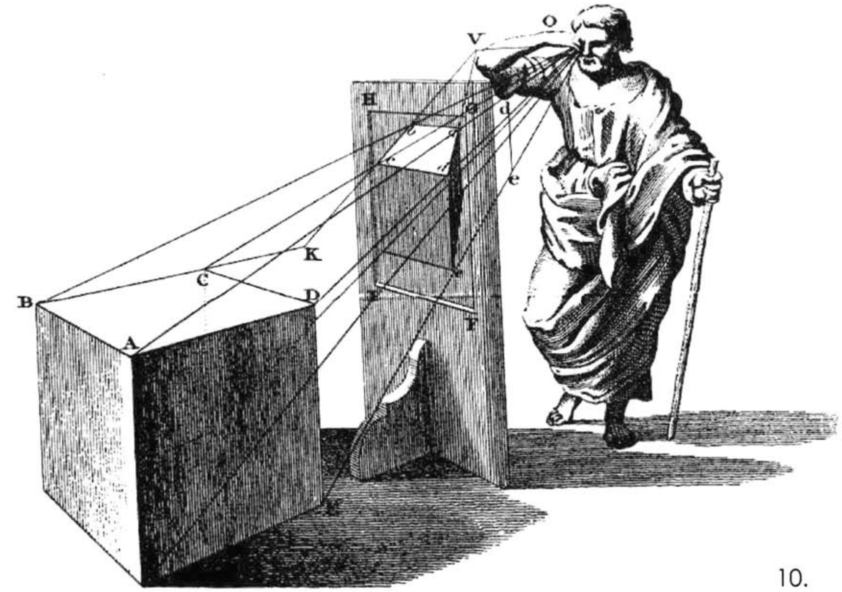
Filippo Brunelleschi's small apertured perspective device was invented in 1425. Brunelleschi's device uses two basic optical devices, the mirror and a small aperture. Brunelleschi wanted to create a theory for perspective in which the eye sees objects in three dimensions, and then places them into two dimensions. Brunelleschi's perspective device demonstrated that there was a vanishing point in three-dimensional space, where specific lines of perspective converge on a point farthest from the eye.

Brunelleschi represented the reality of three dimensions by looking through an aperture the size of a bean, about 3/16 of an inch, drilled into a painting. The painting was reflected back towards him in a mirror. When the mirror was removed there was a three dimensional duplicate of the painting. In order to accomplish this, Brunelleschi had to be standing the correct distance in front of the building; this represents the focal length of the device. Brunelleschi's theory demonstrated that three dimensional spaces could accurately be represented in two dimensions.

With this theory, known as the "theory of one-point perspective," and his perspective device, Brunelleschi ushered in the Renaissance. [10] Brunelleschi's device demonstrates the principle of the camera obscura, in which a projected image of an exterior environment is viewed within a darkened room in which a small aperture, about the diameter of a pencil, is located within a blackened out window. The image is projected through the aperture, on to the walls, floor and ceiling and is upside down and reversed.



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Another Renaissance man who explored one point perspective and the use of the small aperture is Leonardo Da Vinci (1452 – 1519). The following quote is from one of Da Vinci's manuscripts, in which he discusses one of his aperture experiments.

An experiment, showing how objects transmit their images or picture, intersecting within the eye in the crystalline humour. This is shown when the images of illuminated objects penetrate into a very dark chamber by some small round hole. Then, you will receive these images on a white paper placed within this dark room and rather near to the hole, and you will see all the objects on this paper in their proper forms and colors, but much smaller. [11]

One of the greatest examples of painting using one-point perspective is Leonardo Da Vinci's Last Supper. The vanishing point goes directly to Christ's right eye. [12] This is an example of the use of a fixed point. Figure 10 describes Da Vinci's use of a fixed point in which one eye is being used to view the top of a cube ABCD. It is placed into projection within the Leonardo window, which is the surface of intersection FGHI. [13] Da Vinci experimented with the use of the aperture as a device for capturing reality in paintings and drawings.

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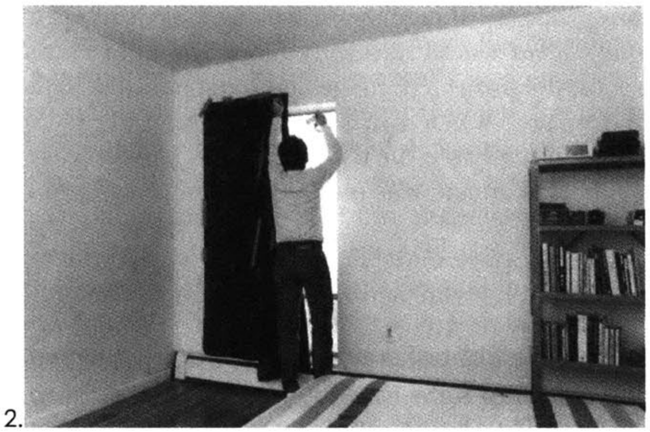
12. 

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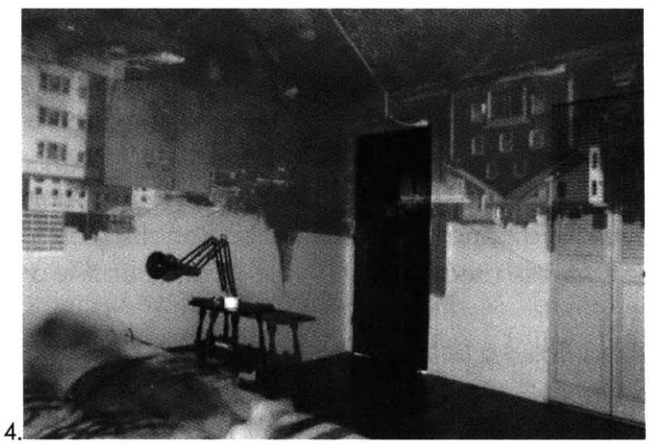
14. 

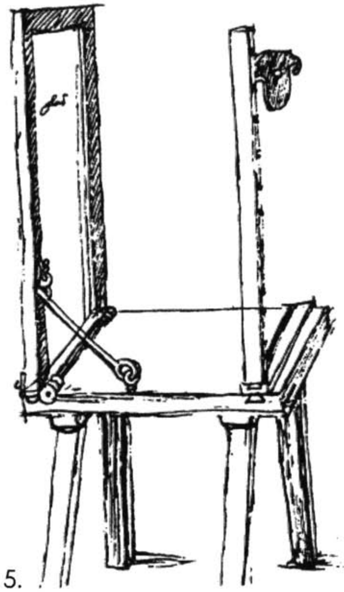
Figures 11-14 describe the conversion of a bedroom into a camera obscura. The window is blacked out with an opaque material. A hole about the size of a penny acts as an aperture. Once all the light is turned off, an image upside down and reversed will appear on the walls and ceiling. All the images are from *How to Convert an Ordinary Room into a Camera Obscura* © Robert Rosinsky

I say that the front of a building – or any open piazza or field is illuminated by the sun has a dwelling opposite to it, and if, in the front which does not face the sun, you make a small round hole, all the illuminated objects will project their images through that hole and be visible inside the dwelling on the opposite wall which should be made white; and there, in fact, they will be upside down, and if you make similar openings in several places in the same wall you will have the same result from each. Hence the images of the illuminated objects are all everywhere on this wall and all in each minutest part of it. The reason, as we clearly know, is that this hole must admit some light to the said dwelling and the light admitted by it is derived from one or many luminous bodies. If these bodies are of various colors and shapes the rays forming the images are of various colors and shapes, and so will the representations be on the wall . [14]

In 1525 Albrecht Durer (1471-1528) wrote has manuscript, the Book of Measurements. Durer was A German who was responsible for transporting concepts of the Italian Renaissance taught to him by Da Vinci to his native country. He included many drawings of instruments for the creation of one- point perspective drawings using a fixed point. In his *Book of Measurements*, Durer wrote:

Perspective is a Latin word meaning "Seeing-Through"
[Seeing through the small aperture] To this same "seeing through" belong five things.

1. *The first is the eye that sees.*
2. *The second is the object seen.*
3. *The third is the distance between 9eye and object)*
4. *The fourth; one sees everything by means of straight lines, that is to say the shortest lines.*
5. *The fifth is the dividing from one another of the things seen.* [15]



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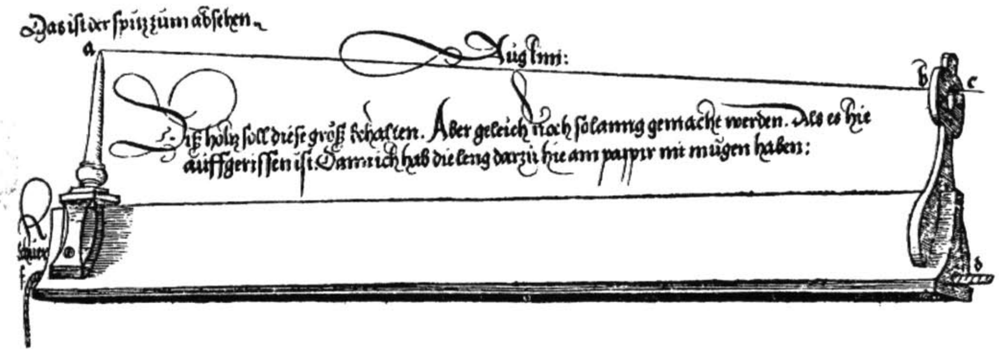

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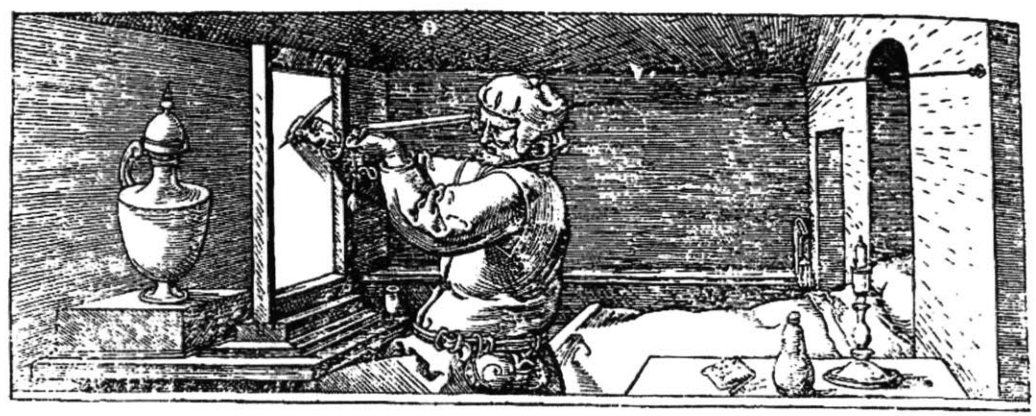

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15. Albrecht Durer, Perspective Apparatus, from *Book of Mesurements,* circa 1525

16. Albrect Durer, Perspective Device, from *Book of Instruments,* circa 1525

17. Albrecht Durer, Perspective Device from *Book of Instruments*, circa 1525

18. Pinhole camera with two apertures made from ordinary one gallon paint can.

19.The resulting image from the paint can camera, represented as a negative.

20. A positive of the same image.

Following the 15th century perspective was quickly accepted because of its ability to recreate the same image that was present in reality. By the seventeenth century scientific philosophers such as Kepler, Galileo, Descartes and Newton proved that linear perspective conforms to the same processes of human vision. The pinhole device developed greatly following the modern day invention of photography in 1839. Sir David Brewster, a well known English scientist, explained the concepts of pinhole photography in his 1856 book, The Stereoscope.

Pictures thus taken are accurate representations of the object, whether it be lineal, superficial, or solid, as seen from or through the hole; and if we throw sufficient light upon the object, or make the material which receives the image very sensitive, we should require no other camera for giving us photographs of all sizes. The only source of error which we can conceive is that which may arise from the inflexion of light, but we believe that it would exercise a small influence, if any, and it is only by experiment that its effect can be ascertained.... And I have no doubt that when chemistry has furnished us with a material more sensitive to light, a camera without lenses, and with only a pin-hole, will be the favorite instrument of the photographer. [16]

19.

20.

21. Pinhole Image from paint can camera with one aperture. The aperture is represented at the left of th eimage. The paper was closest to the aperture at this point.

The technical aspects of photography have changed very little since the first part of the 20th century. The concepts expressed by Brewster are still relevant today. For this investigation I began by designing a series of Pinhole cameras that were specific to a place and a condition. Each camera has a pinhole (or multiple pinholes) at a specific diameter, and a specific focal length. The cameras capture an image on a light sensitive paper which is developed using traditional black and white photographic techniques. The pinhole acts as basically a very accurate light leak. The pinhole is about the size of a needle; if you know the specific diameter, to the hundredths of an inch, you can calculate the correct focal length, which will give you a correctly focused image.

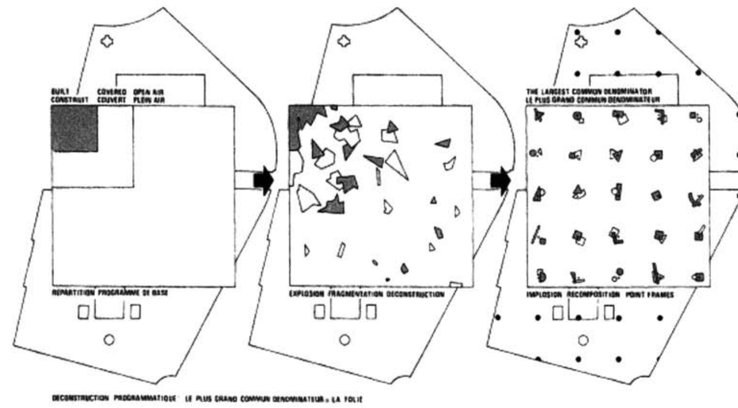
There is a very complicated scientific approach to pinhole photography, with pinhole diameters and focal lengths all relative to exposure times, which is conditional, based on such things as cloud cover, time of day and time of year. Figure 22 represents "pinhole calculations from 10 to 1000 mm focal lenghts." There are three important facts to remember concerning pinhole photography;

1. Light intensity decreases the further it travels from the pinhole.
2. As the focal distance increases the optimal pinhole increases in diameter.
3. For every focal length, there is an optimal pinhole diameter. [17]

Pinholes	10 mm	0.037 used in function
Increment	10 mm	

Focal Length(mm)	Pinhole Diam.(mm)	Pinhole Diam.(in)	f-stop	Time-Rel. to f/64	Focal Length(in)	Focal Length(ft)
10	0.1170	0.0046	85	1.8	0.39	0.03
20	0.1655	0.0065	121	3.6	0.79	0.07
30	0.2027	0.0080	148	5.3	1.18	0.10
40	0.2340	0.0092	171	7.1	1.57	0.13
50	0.2616	0.0103	191	8.9	1.97	0.16
60	0.2866	0.0113	209	10.7	2.36	0.20
70	0.3096	0.0122	226	12.5	2.76	0.23
80	0.3309	0.0130	242	14.3	3.15	0.26
90	0.3510	0.0138	256	16.0	3.54	0.30
100	0.3700	0.0146	270	17.8	3.94	0.33
110	0.3881	0.0153	283	19.6	4.33	0.36
120	0.4053	0.0160	296	21.4	4.72	0.39
130	0.4219	0.0166	308	23.2	5.12	0.43
140	0.4378	0.0172	320	25.0	5.51	0.46
150	0.4532	0.0178	331	26.7	5.91	0.49
160	0.4680	0.0184	342	28.6	6.30	0.52
170	0.4824	0.0190	352	30.3	6.69	0.56
180	0.4964	0.0195	363	32.2	7.09	0.59
190	0.5100	0.0201	373	34.0	7.48	0.62
200	0.5233	0.0206	382	35.6	7.87	0.66
210	0.5362	0.0211	392	37.5	8.27	0.69
220	0.5488	0.0216	401	39.3	8.66	0.72
230	0.5611	0.0221	410	41.0	9.06	0.75
240	0.5732	0.0226	419	42.9	9.45	0.79
250	0.5850	0.0230	427	44.5	9.84	0.82
260	0.5966	0.0235	436	46.4	10.24	0.85
270	0.6080	0.0239	444	48.1	10.63	0.89
280	0.6191	0.0244	452	49.9	11.02	0.92
290	0.6301	0.0248	460	51.7	11.42	0.95
300	0.6409	0.0252	468	53.5	11.81	0.98
310	0.6515	0.0256	476	55.3	12.20	1.02
320	0.6619	0.0261	483	57.0	12.60	1.05
330	0.6721	0.0265	491	58.9	12.99	1.08
340	0.6822	0.0269	498	60.5	13.39	1.12
350	0.6922	0.0273	506	62.5	13.78	1.15
360	0.7020	0.0276	513	64.3	14.17	1.18
370	0.7117	0.0280	520	66.0	14.57	1.21
380	0.7213	0.0284	527	67.8	14.96	1.25
390	0.7307	0.0288	534	69.6	15.35	1.28
400	0.7400	0.0291	541	71.5	15.75	1.31
410	0.7492	0.0295	547	73.0	16.14	1.35
420	0.7583	0.0299	554	74.9	16.54	1.38
430	0.7672	0.0302	560	76.6	16.93	1.41
440	0.7761	0.0306	567	78.5	17.32	1.44
450	0.7849	0.0309	573	80.2	17.72	1.48
460	0.7936	0.0312	580	82.1	18.11	1.51
470	0.8021	0.0316	586	83.8	18.50	1.54
480	0.8106	0.0319	592	85.6	18.90	1.57
490	0.8190	0.0322	598	87.3	19.29	1.61
500	0.8273	0.0326	604	89.1	19.69	1.64

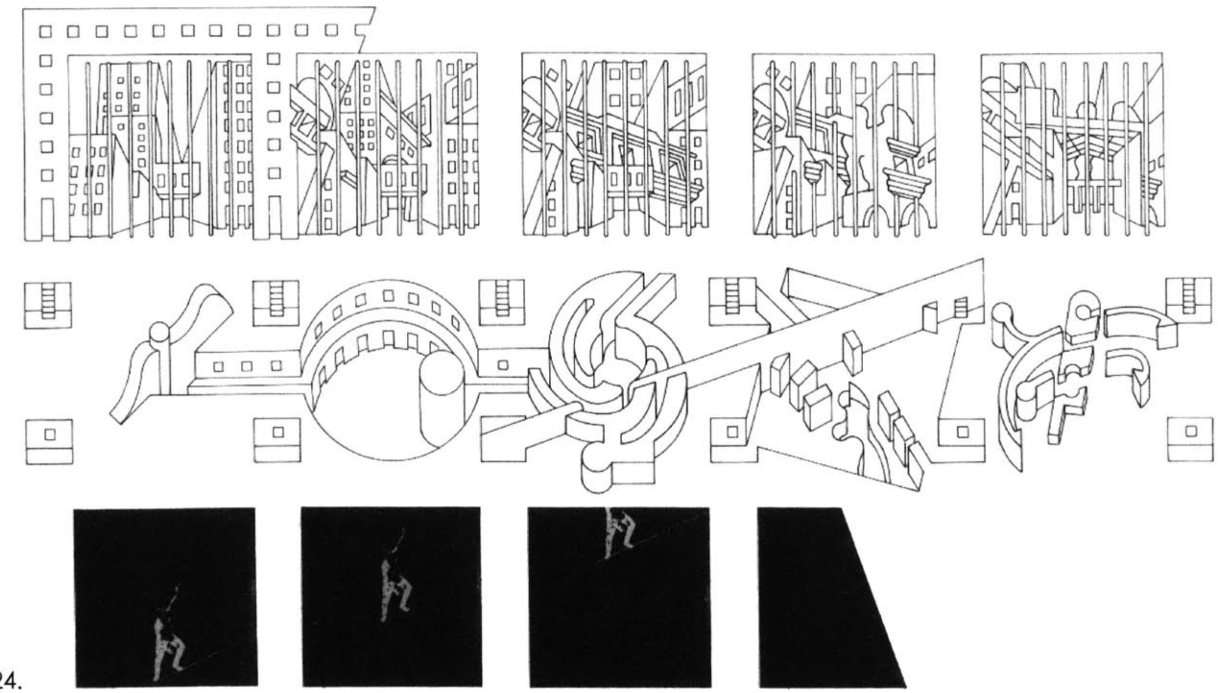
Focal Length(mm)	Pinhole Diam.(mm)	Pinhole Diam.(in)	f-stop	Time-Rel. to f/64	Focal Length(in)	Focal Length(ft)
510	0.8356	0.0329	610	90.8	20.08	1.67
520	0.8437	0.0332	616	92.6	20.47	1.71
530	0.8518	0.0335	622	94.5	20.87	1.74
540	0.8598	0.0339	628	96.3	21.26	1.77
550	0.8677	0.0342	634	98.1	21.65	1.80
560	0.8756	0.0345	640	100.0	22.05	1.84
570	0.8834	0.0348	645	101.6	22.44	1.87
580	0.8911	0.0351	651	103.5	22.83	1.90
590	0.8987	0.0354	656	105.1	23.23	1.94
600	0.9063	0.0357	662	107.0	23.62	1.97
610	0.9138	0.0360	668	108.9	24.02	2.00
620	0.9213	0.0363	673	110.6	24.41	2.03
630	0.9287	0.0366	678	112.2	24.80	2.07
640	0.9360	0.0369	684	114.2	25.20	2.10
650	0.9433	0.0371	689	115.9	25.59	2.13
660	0.9505	0.0374	694	117.6	25.98	2.17
670	0.9577	0.0377	700	119.6	26.38	2.20
680	0.9648	0.0380	705	121.3	26.77	2.23
690	0.9719	0.0383	710	123.1	27.17	2.26
700	0.9789	0.0385	715	124.8	27.56	2.30
710	0.9859	0.0388	720	126.6	27.95	2.33
720	0.9928	0.0391	725	128.3	28.35	2.36
730	0.9997	0.0394	730	130.1	28.74	2.40
740	1.0065	0.0396	735	131.9	29.13	2.43
750	1.0133	0.0399	740	133.7	29.53	2.46
760	1.0200	0.0402	745	135.5	29.92	2.49
770	1.0267	0.0404	750	137.3	30.31	2.53
780	1.0334	0.0407	755	139.2	30.71	2.56
790	1.0400	0.0409	760	141.0	31.10	2.59
800	1.0465	0.0412	764	142.5	31.50	2.62
810	1.0530	0.0415	769	144.4	31.89	2.66
820	1.0595	0.0417	774	146.3	32.28	2.69
830	1.0660	0.0420	779	148.2	32.68	2.72
840	1.0724	0.0422	783	149.7	33.07	2.76
850	1.0787	0.0425	788	151.6	33.46	2.79
860	1.0851	0.0427	793	153.5	33.86	2.82
870	1.0913	0.0430	797	155.1	34.25	2.85
880	1.0976	0.0432	802	157.0	34.65	2.89
890	1.1038	0.0435	806	158.6	35.04	2.92
900	1.1100	0.0437	811	160.6	35.43	2.95
910	1.1161	0.0439	815	162.2	35.83	2.99
920	1.1223	0.0442	820	164.2	36.22	3.02
930	1.1283	0.0444	824	165.8	36.61	3.05
940	1.1344	0.0447	829	167.8	37.01	3.08
950	1.1404	0.0449	833	169.4	37.40	3.12
960	1.1464	0.0451	837	171.0	37.80	3.15
970	1.1524	0.0454	842	173.1	38.19	3.18
980	1.1583	0.0456	846	174.7	38.58	3.22
990	1.1642	0.0458	850	176.4	38.98	3.25
1000	1.1700	0.0461	855	178.5	39.37	3.28



23.

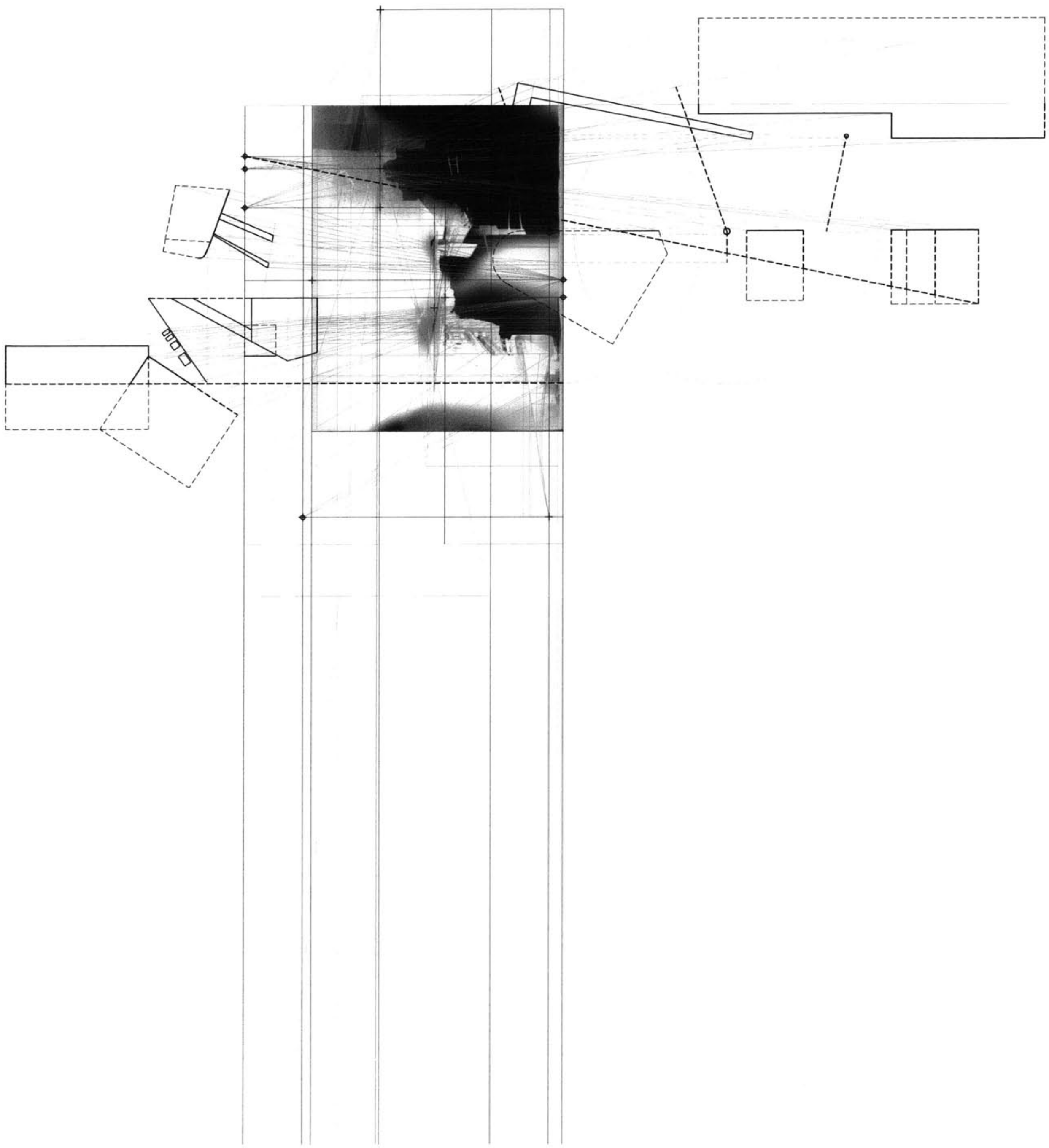
A number of formulas can be used to determine the correct exposure times for certain diameter pinholes and specific focal lengths. However, it is generally assumed that the best way to learn the concepts of pinhole photography is to experiment with different exposure times at a variety of conditions. For this thesis I designed a series of pinhole cameras that I used to investigate Kenmore Square, an urban area in Boston, Massachusetts. Each camera was specifically designed to investigate a particular condition of the site. A series of tests were completed using basic materials such as paint cans, oatmeal boxes and aluminum cans. Each test revealed simple concepts that I could explore further through the development of complex cameras. Many of the cameras I designed used multiple pinhole apertures. Each aperture would result in an image. Multiple pinholes resulted in the overlapping of images with; each image would be from a different location, therefore the vanishing points of each image would be located at a different position. The cameras each used an 11" x 14" photographic, light sensitive, paper. Once the paper was exposed and developed the result would be a paper negative that captured a photographic representation of the place relative to the device.

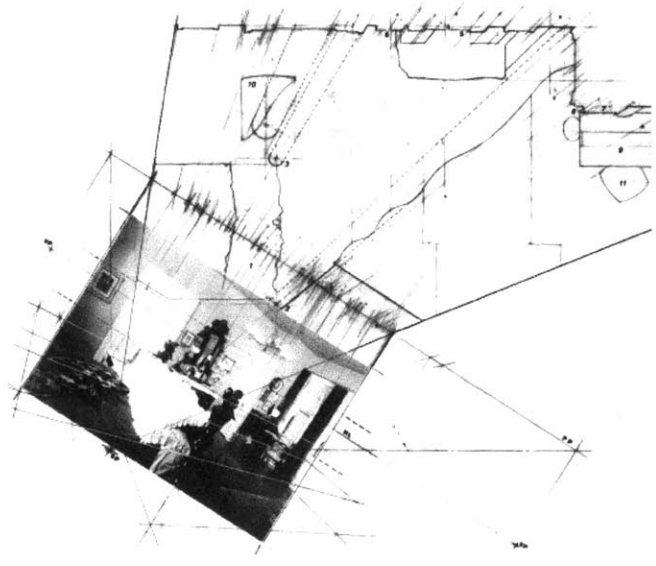
The cameras deigned for this investigation were each analyzed, describing how the cameras worked and how and where the image was captured. The analysis revealed the programmatic conditions of the cameras, or rather the possible variations of each camera. Each camera could be modified in a specific way that would alter the resulting image. The variations of the programmatic conditions would later remerge at the development of the architectural device used for experiencing the uncertainties of a place. The layering of program results in a "superimposition of various independent layers one upon the other to produce a heterogeneous and 'thickened' surface." [18] Design strategies used by both Rem Koolhaas and Bernard Tschumi (figure 23) for the Park de la Villette project in Paris in 1983 employ layering strategies that "dismantle the programmatic and logistical aspects of the park into a series of layers, each of which is then considered independently from the other layers." [19] The system of organization of each layer depends on its function.



24.

Another project by Tschumi, the Manhattan Transcripts, (figure 24)was a set of theoretical drawings that were assembled between 1976 and 1981. They are a frame-by-frame sequence describing an "architectural inquest," introducing an order of experiences; a sequence of times and or moments which describe an "architectural interpretation of reality." [20] The transcripts use photography as a means of directing or witnessing events. These events can take the form of functions or programs. At the same time, architectural representations such as plans, sections and diagrams of spaces are used to represent the movement of the people who intrude on the architectural space. They are a device designed to transcribe the complex relationship between spaces and their uses. This reality is normally removed from conventional methods of architectural representation. Plans, sections, axonometric and perspectives each imply the logic of architectural thought, while leaving out the illogical nature of reality. Tschumi inserts this reality into an architectural representation designed to inform the relationship between spaces, objects and events. Tschumi's work represents the relationship between space, event, and movement. He specifically engages relationships between "the formal elaboration of spaces" and program. [21] The uncertainty of events, including uses, activities and incidents provide a variety of spaces and movement sequences.





26.

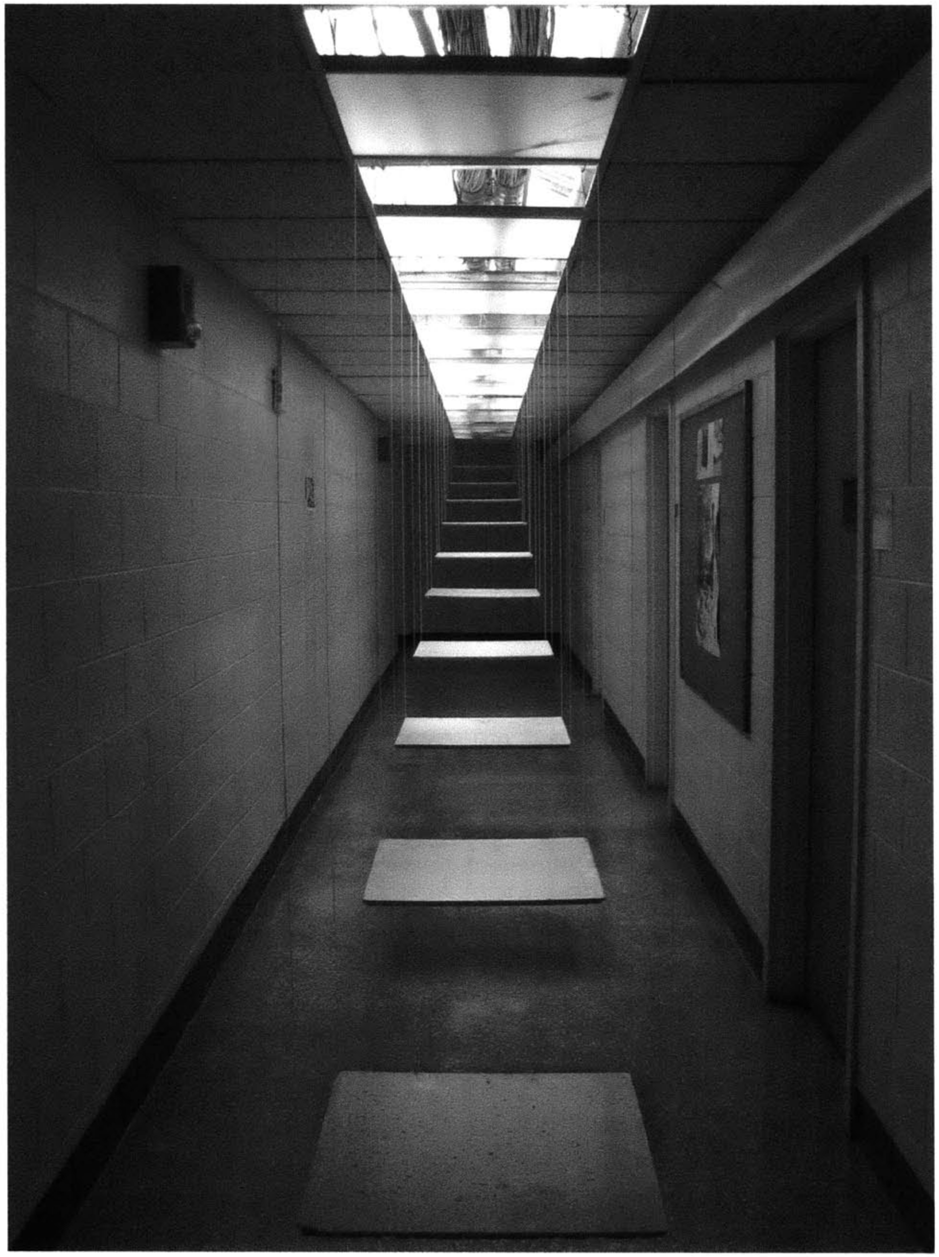
25. Image reconstruction. Overlapping plans re-engineered from a Pinhole Image.

26. Constructed Plan from Photograph of Hotel Room. From Diller and Scofido, *Scanning*

The images produced by the pinhole cameras are representations of the existing place. Comparing the image constructed with the existing site conditions reveals a new site. Comparing the existing site with the reconstructed site reveals potential undefined space. Conceptually, this process could be used to re-program a site, or as a means of assigning program, such as commercial interests or housing.

In order to understand the images created by the cameras, it was necessary to map the image. According to James Corner in The Agency of Mapping: Speculation, Critique and Invention; "Long affiliated with the planning and design of cities, landscapes and buildings, mapping is particularly instrumental in the construing and constructing of lived space. In this active sense, the function of mapping is less to mirror reality than to engender the re-shaping of the worlds in which people live." [22]

The image reconstruction evolved through a series of design strategies, resulting in a series of three dimensional form studies at an urban scale and a building scale. At the building scale, the form studies generated a building that acts as a device for experiencing an urban place. The user can occupy the form, experiencing the exterior environment through the filter of the device. Intersecting elements provide multiple perspectives, increasing the users understanding of there relationship to both the architecture and the place. In this way, the architectural device mediates the relationship between the urban landscape and the body.



27. Corridor Installation.
Massachusetts Institute of Technology
September 2004

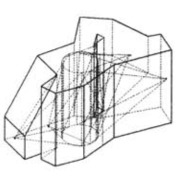
The development of this thesis began as an exploration of a space interrupted. A skateboarder interprets a place, thus redefining the experience. They introduce spatial interruptions, using found objects. Similar to this, a corridor could be redefined, revealing a level of uncertainty that might not otherwise be experienced. Qualities of tension, compression, and gravitation exist along side the experiential movement found within the space of the corridor. In the example on the following page, I intervened within the corridor network at the Massachusetts Institute of Technology at a specific moment; opening up the ceiling to reveal a skylight that had been hidden by a dropped ceiling and a vast array of utility cables and piping. The ceiling panels were alternately "dropped" from the ceiling and suspended in mid-air in a stepped formation. The fluidity of the corridor was interrupted by the ceiling tiles and space was redefined and rediscovered.

Iain Borden analyzes the act of skateboarding as a performance and as a representation involving the relationship between the body, board and the landscape. According to Borden this "'body-centric space production' of time, touch, sound, muscle movement, balance, rhythm, and counter-rhythm is a set of complex spatial actions." A skateboarder uses a series of complex spatial actions to navigate there boards through the urban environment, generating a production of body oriented space. The skateboarder interrogates architecture in relationship to the body. According to Claire Robinson in her article Browsing, Bouncing, Murdering and Mooring, "In this way, the skateboarder and the architecture are inseparable and simultaneously defy and embody representation." The representation of a place generated by the device mediates the relationship between the body and the landscape. This thesis explores the production of architectural form with respect to the uncertainties of our built environment, strategies of representation, and the research, analysis and implementation of urban devices that redefine the spatial experience.

PINHOLE CAMERAS

Pinhole Camera Devices at Kenmore Square
Boston, Massachusetts. (October 2005)

ARCHITECTURE OF UNCETAINTY



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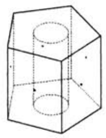
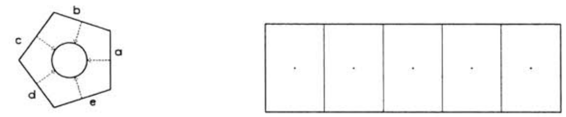
SPECIFICATIONS

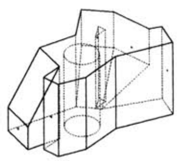
The pinhole cameras are constructed with simple, durable materials, 3/16" black foam core with chipboard. Black Duct (racing) tape was used to protect against light leaks. The apertures were drilled into a light gauge aluminum commonly found in Soda cans. Some of the apertures are laser-drilled and provided from an outside source. Other apertures were drilled using a specific size needle. A piece of tape or chipboard was used as a shutter. The light sensitive paper was loaded in the darkroom under controlled conditions. The paper was exposed for a specific time depending on the time of day and the specific weather condition. Each camera could only be used once while on site. The paper was loaded into the camera in a controlled environment, and then taken to the site and exposed. Each image exposure was documented, noting the time of day, location, weather condition and exposure time.



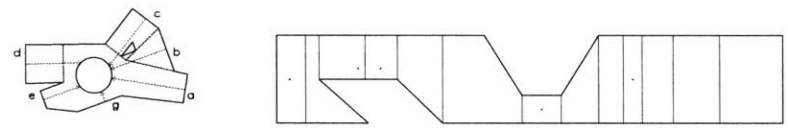
K-1A: Pentagon shaped control camera with five pinholes each with equal diameter and focal length. Camera captures a 360 degree image on 11" x 14" paper located at the center of the camera.



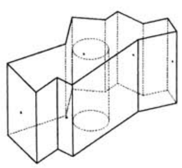
APERTURE SIZE	OPTIMAL FOCAL LENGTH
(a) .0126" / .320mm	(a) 2.886" / 73.32mm
(b) .0126" / .320mm	(b) 2.886" / 73.32mm
(c) .0126" / .320mm	(c) 2.886" / 73.32mm
(d) .0126" / .320mm	(d) 2.886" / 73.32mm
(e) .0126" / .320mm	(e) 2.886" / 73.32mm



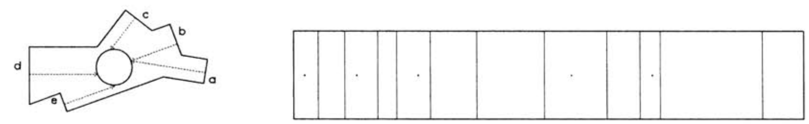
K-2A: The geometry of this camera is derived from the site lines found at Kenmore Square. The shape of the camera is a result of this geometric analysis. The image is captured on 11" x 14" paper located at the center of the camera.



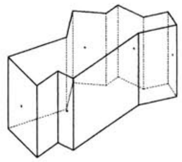
APERTURE SIZE	OPTIMAL FOCAL LENGTH
(a) .0225" / .572mm	(a) 9.204" / 233.80mm
(b) .0200" / .508mm	(b) 7.272" / 184.73mm
(c) .0200" / .508mm	(c) 7.272" / 184.73mm
(d) .0181" / .460mm	(d) 5.956" / 151.30mm
(e) .0160" / .406mm	(e) 4.654" / 118.23mm
(g) .0087" / .220mm	(g) 1.376" / 34.96mm



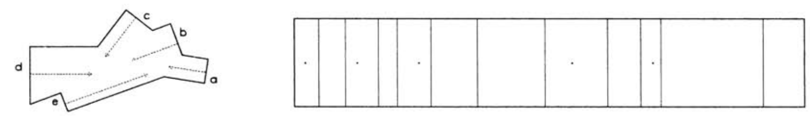
K-3A: Similar in shape to K-2A, this camera is also derived from a geometric analysis of Kenmore square. However it is designed for two different image capture configurations. In this setup the image is captured on one 11" x 14" paper located at the center of the camera.

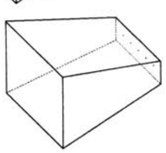


APERTURE SIZE	OPTIMAL FOCAL LENGTH
(a) .0225" / .572mm	(a) 9.204" / 233.80mm
(b) .0181" / .460mm	(b) 5.956" / 151.30mm
(c) .0160" / .406mm	(c) 4.654" / 118.23mm
(d) .0200" / .508mm	(d) 7.272" / 184.73mm
(e) .0138" / .351mm	(e) 3.462" / 87.95mm

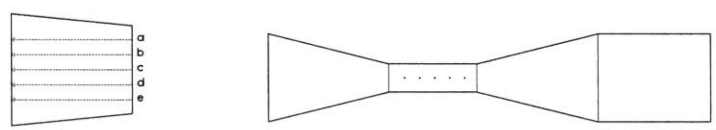


K-3B: In this configuration the camera captures the image on two pieces of 11" x 14" paper located at both of the sidewalls of the camera. The center cylinder has been removed from the camera.

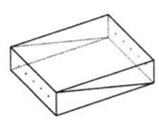




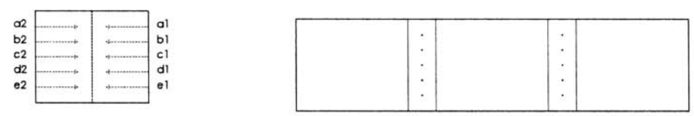
R1: This camera utilizes 5 pinholes of equal diameter spaced an equal distance from each other. The multiple pinholes result in repeating images. The images are each slightly shifted as a result of the position of the pinholes relative to each other.



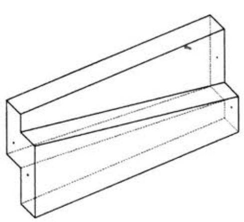
APERTURE SIZE	OPTIMAL FOCAL LENGTH
(a) .0180" / .457mm	(a) 6.181" / 157.00mm
(b) .0180" / .457mm	(b) 6.181" / 157.00mm
(c) .0180" / .457mm	(c) 6.181" / 157.00mm
(d) .0180" / .457mm	(d) 6.181" / 157.00mm
(e) .0180" / .457mm	(e) 6.181" / 157.00mm



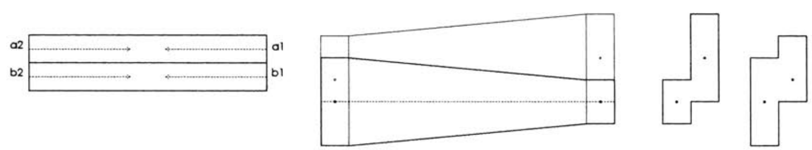
S1/2: This camera utilizes a multiple set of five pinholes, each equal in diameter. Inside the camera is a diagonal plane that is designed to hold an 11" x 14" piece of paper on each side. The five pinholes result in repeating images similar to camera R1. The diagonal plane results in a skewed image that isolates a portion of the image, depending on the camera orientation.



APERTURE SIZE	OPTIMAL FOCAL LENGTH
(a1/2) .0240" / .610mm	(a1/2) 10.98" / 279.00mm
(b1/2) .0240" / .610mm	(b1/2) 10.98" / 279.00mm
(c1/2) .0240" / .610mm	(c1/2) 10.98" / 279.00mm
(d1/2) .0240" / .610mm	(d1/2) 10.98" / 279.00mm
(e1/2) .0240" / .610mm	(e1/2) 10.98" / 279.00mm

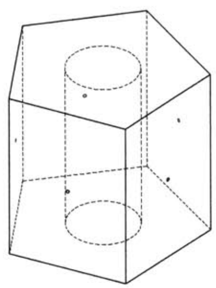


Edge: This camera was designed to sit on the edge of a surface, such as a curb or ledge. It is a narrow camera that isolates a small amount of information on the vertical plane, but is also designed to capture the length and texture of the edge at the bottom and top of the camera. There is an opening between each element that lets a portion of the two images to overlap.



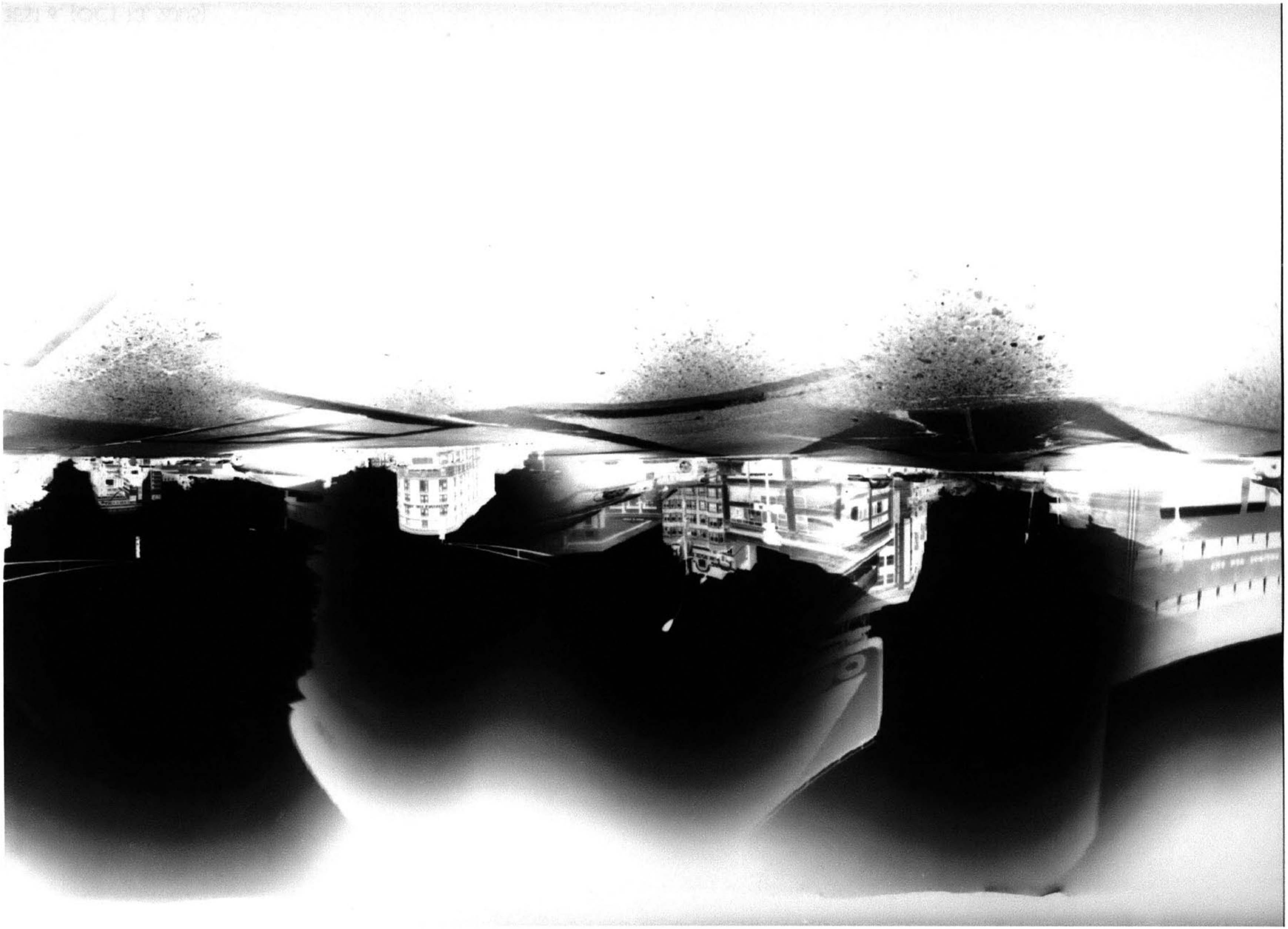
APERTURE SIZE	OPTIMAL FOCAL LENGTH
(a1/2) .0380" / .965mm	(a1/2) 25.282" / 642.16mm
(b1/2) .0380" / .965mm	(b1/2) 25.282" / 642.16mm

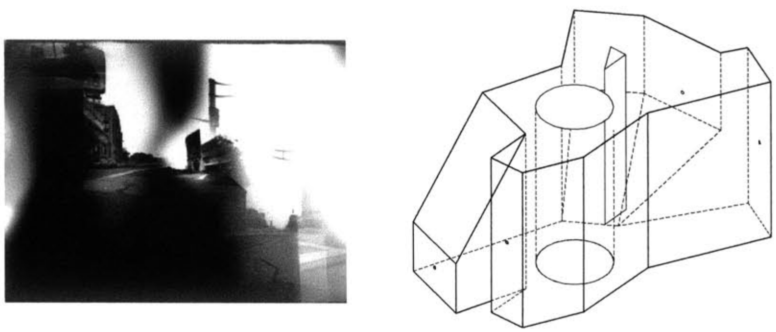
PINHOLE IMAGES



K-1A: Pentagon shaped control camera with five pinholes each with equal diameter and focal length. Camera captures a 360 degree image on 11" x 14" paper located at the center of the camera.

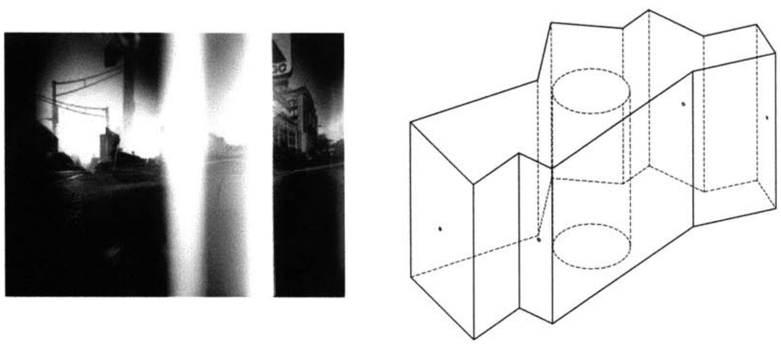
TEST 5. (OCT 13, 2005)





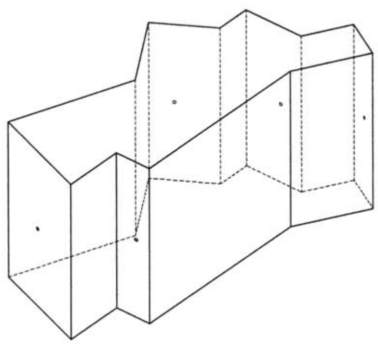
K-2A: The geometry of this camera is derived from the site lines found at Kenmore Square. The shape of the camera is a result of this geometric analysis. The image is captured on 11" x 14" paper located at the center of the camera.

TEST 6. (OCT 13, 2005)



K-3A: Similar in shape to K-2A, this camera is also derived from a geometric analysis of Kenmore square. However it is designed for two different image capture configurations. In this setup the image is captured on one 11" x 14" paper located at the center of the camera.

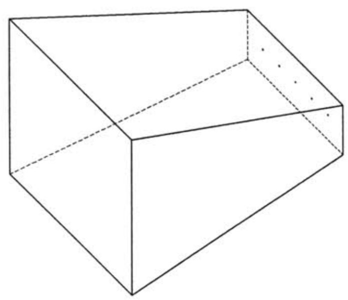
TEST 12. (OCT 20, 2005)



K-3B: In this configuration the camera captures the image on two pieces of 11" x 14" paper located at both of the sidewalls of the camera. The center cylinder has been removed from the camera.

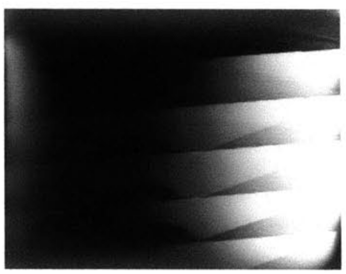
TEST 7. (OCT 20, 2005)

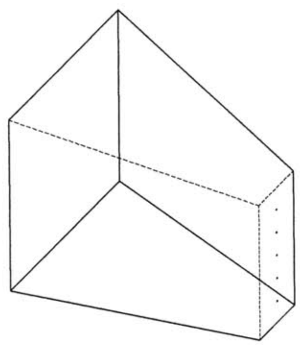

CITGO
Now taking reservations for



R1: This camera utilizes 5 pinholes of equal diameter spaced an equal distance from each other. The multiple pinholes result in repeating images. The images are each slightly shifted as a result of the position of the pinholes relative to each other.

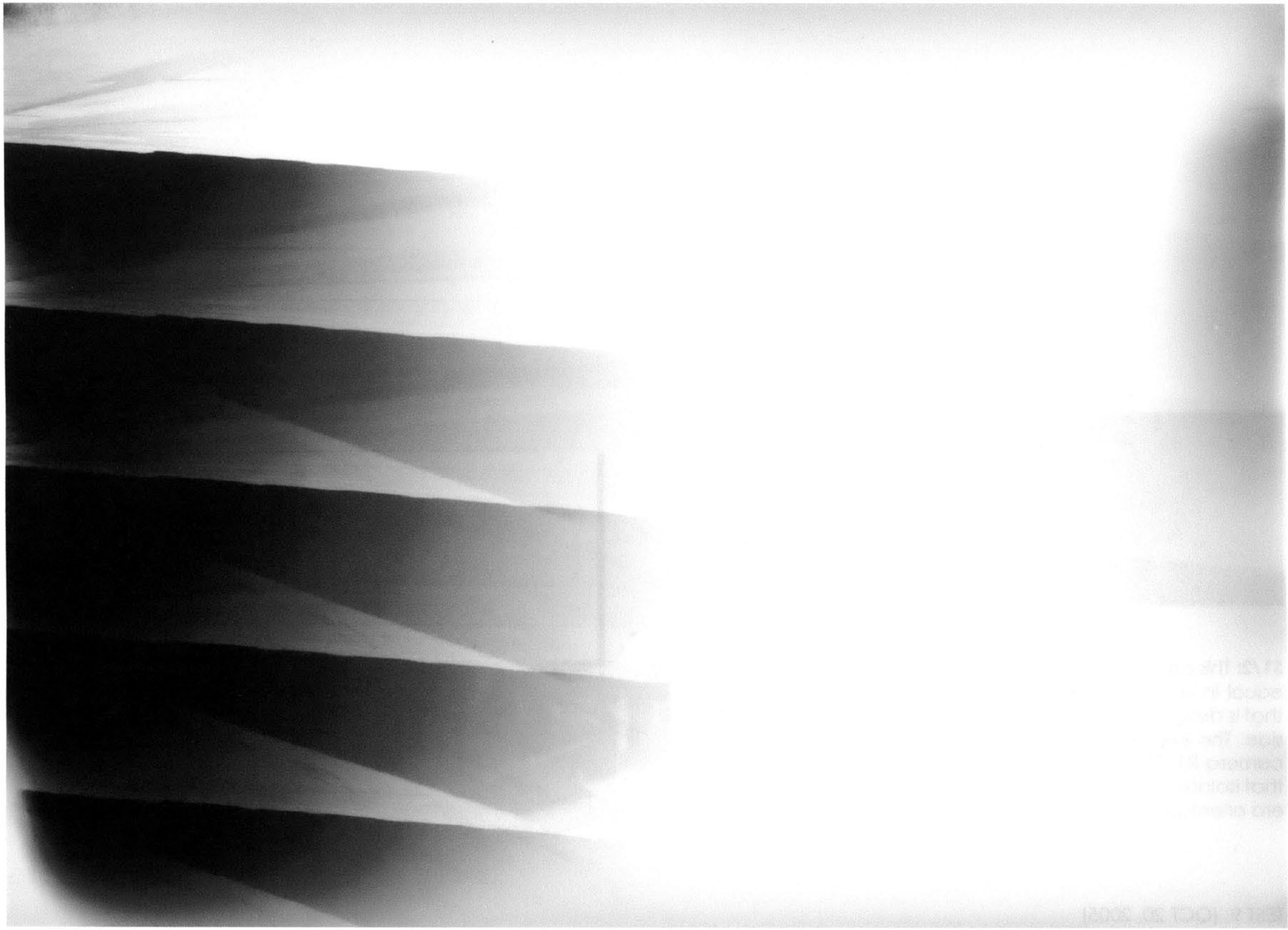
TEST 11. (OCT 20, 2005)

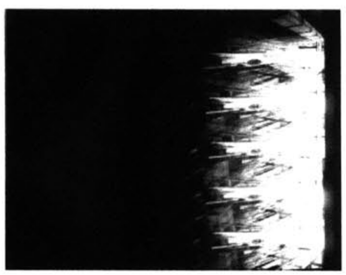


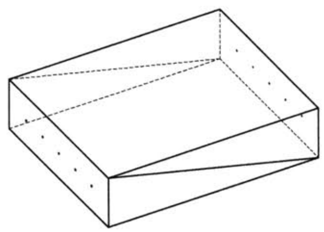


R1: This camera utilizes 5 pinholes of equal diameter spaced an equal distance from each other. The apertures are rotated perpendicular to the ground plane.

TEST 4. (OCT 13, 2005)

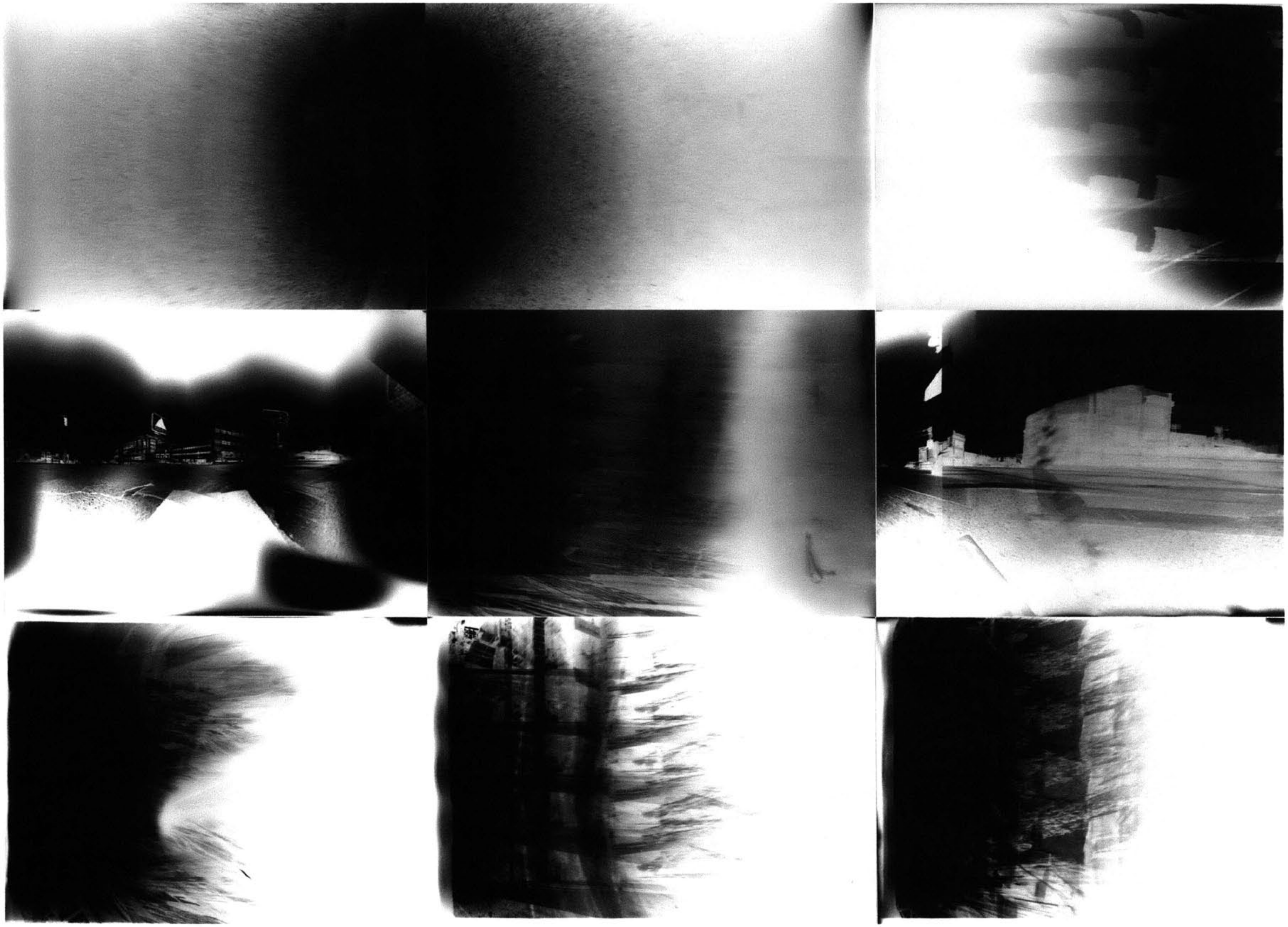


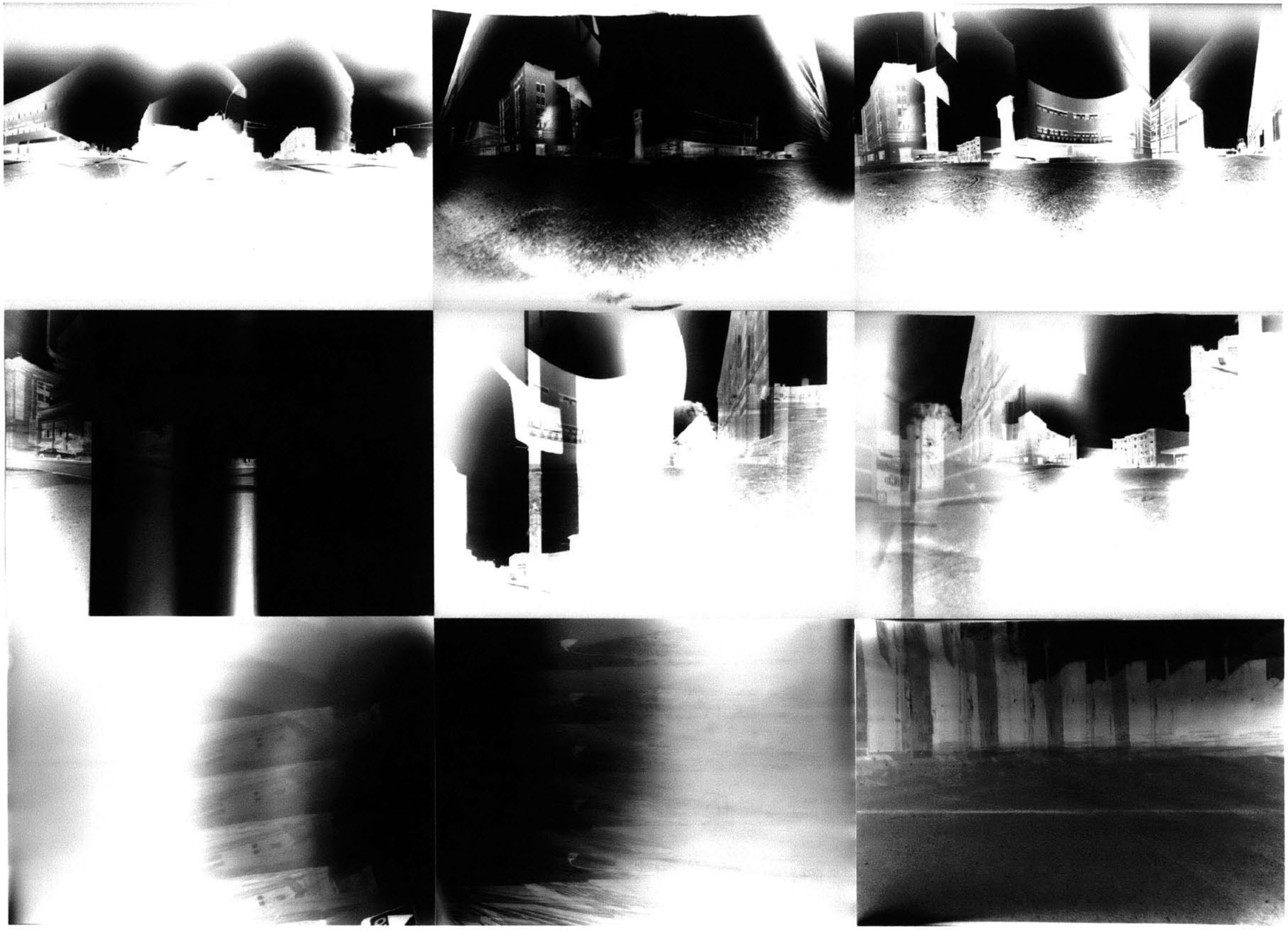


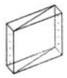
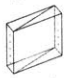
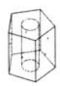
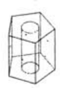
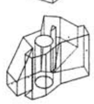
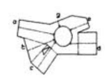
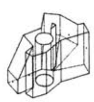
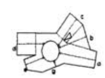
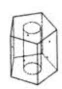
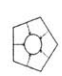
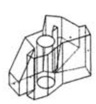
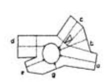


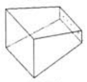
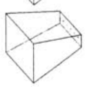
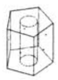
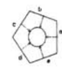
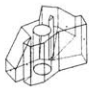
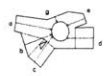
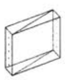
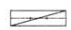
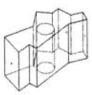
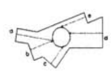
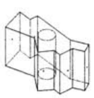
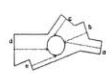
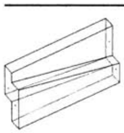
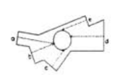
S1/2: This camera utilizes a multiple set of five pinholes, each equal in diameter. Inside the camera is a diagonal plane that is designed to hold an 11" x 14" piece of paper on each side. The five pinholes result in repeating images similar to camera R1. The diagonal plane results in a skewed image that isolates a portion of the image, depending on the camera orientation.

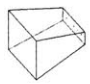
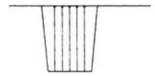
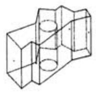
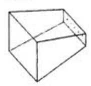
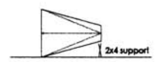
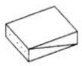
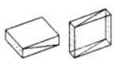
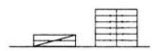
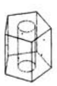
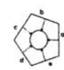
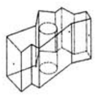
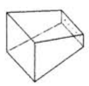
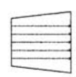
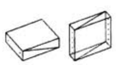
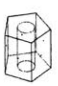
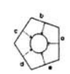
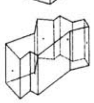
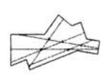
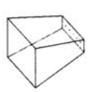
TEST 9. (OCT 20, 2005)

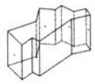
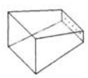
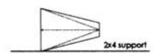
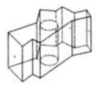
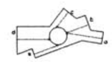




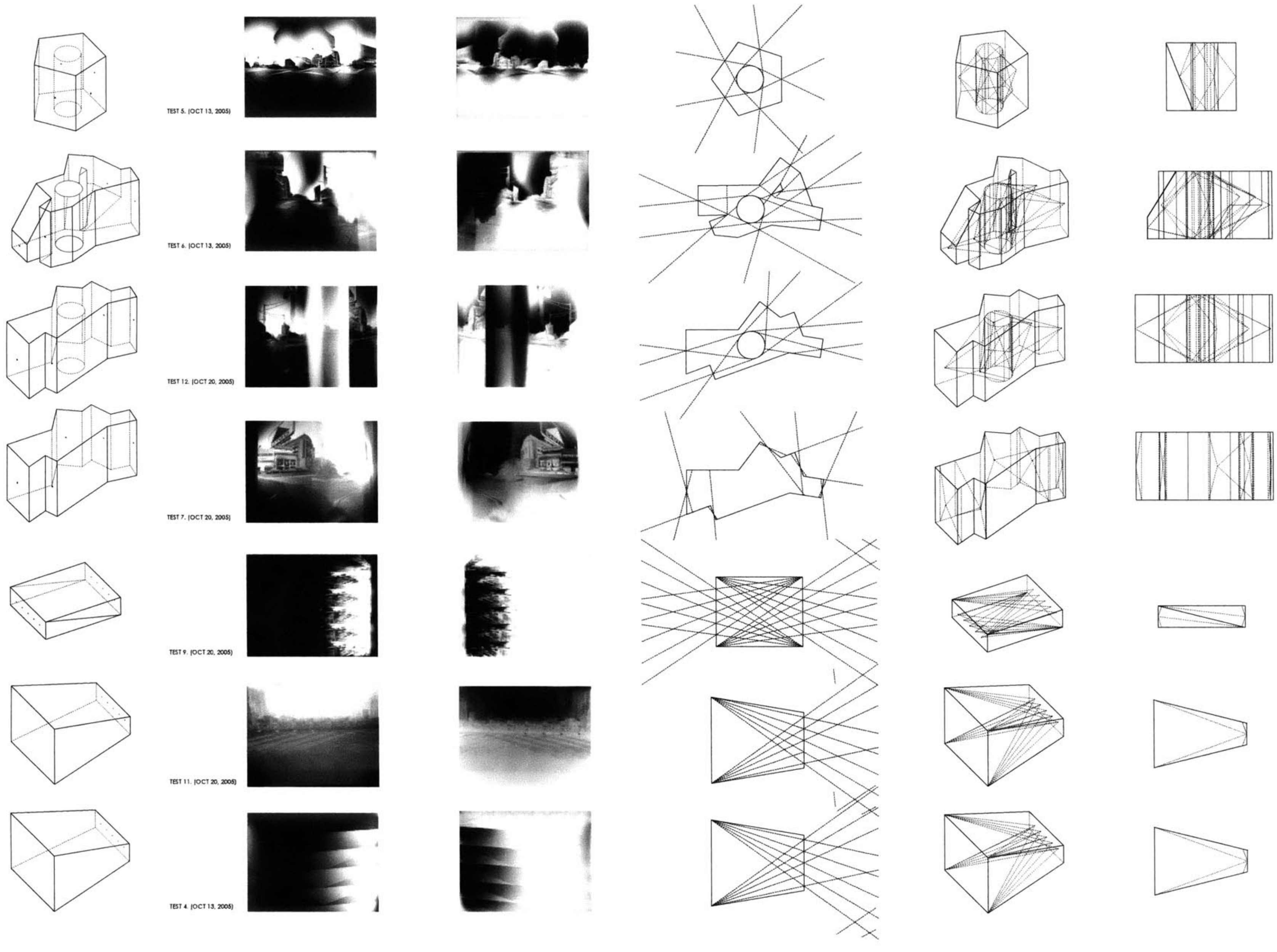
CAMERA	TEST	DATE	LOCATION		TIME	WEATHER CONDITIONS	EXPOSURE TIME	NOTES
	1.	T. OCT 11, 2005	Camera was placed vertically against window outside MIT building N51 facing northwest and northeast. The camera took two shots concurrently.		4:50 - 5:00pm	Cloudy with Wind	Concurrent shots: 60 second exposure for northwest direction (towards sun), 120 second exposure for northeast direction (away from sun)	
	2.	T. OCT 11, 2005	Camera was placed vertically against a brick wall of a building located across the street from MIT building N51.		5:10 - 5:20pm	Cloudy with Wind	Same exposure times as Test 1 (Oct 11, 2005)	No results due to paper error.
	3.	T. OCT 11, 2005	Same location as Test 2 (Oct 11, 2005)		5:30 - 5:40pm	Cloudy with Wind	120 second exposures, both sides	Paper was curled inside camera reducinf focal lenght.
	4.	T. OCT 11, 2005	Camera was placed horizontally on parking lot surface across from MIT building N51.		5:50 - 6:00pm	Cloudy with Wind	180 second exposures, both sides	No results on one side, facing MIT building N51, due to paper error.
	5.	T. OCT 11, 2005	Camera was placed horizontally on table located inside VAP lab in MIT building N51.		8:00 - 8:05pm	Flurescent lights	300 second exposure	Only captured lights at this exposure time.
	6.	T. OCT 11, 2005	Sames location as Test 5. (Oct 11, 2005)		8:15 - 8:30pm	Flurescent lights	Fifteen minute exposure.	
	7.	T. OCT 11, 2005	Same as Test 5. and 6. (Oct 11, 2005)		9:00 - 9:30pm	Flurescent lights	Thrity minute exposure.	
	1.	W. OCT 12, 2005	Corner outside of Cambridge Bicycle Company, across street from MIT building N51. Camera was placed on surface.		12:10 - 12:20pm	Cloudy, Windy, with light Rain	180 second concurrent exposure.	
	2.	W. OCT 12, 2005	Same location as Test 1, (Oct 12, 2005)		12:20 - 12:30pm	Cloudy, Windy, with light Rain	90 second concurrent exposure.	
	3.	W. OCT 12, 2005	Same location as Test 2, (Oct 12, 2005)		12:50 - 1:00pm	Cloudy, Windy, with light Rain	a/b: 90 second concurrent exposure c: 60 second exposure d: 120 second exposure e/g: 90 second concurrent exposure	
	4.	W. OCT 12, 2005	Same as Test 3, (Oct 12, 2005), camera was bottom side up and oriented opposite as Test 3.		1:20 - 1:30pm	Cloudy, Windy, with light Rain	Same exposure times as Test 3, (Oct 12, 2005)	
	5.	W. OCT 12, 2005	Kenmore Square, west side of camera in center Medium between Beacon Street and Commonwealth Ave.		3:30 - 4:00pm	Cloudy, Windy, with Rain	120 second concurrent exposure	
	6.	W. OCT 12, 2005	Same location as Test 5. (Oct 12, 2005)		3:30 - 4:00pm	Cloudy, Windy, with Rain	a/b: 120 second concurrent exposure c: 90 second exposure d: 150 second exposure e/g: 120 second concurrent exposure	

CAMERA	TEST	DATE	LOCATION	TIME	WEATHER CONDITIONS	EXPOSURE TIME	NOTES
	1.	TR. OCT 13, 2005	Camera was placed vertically against brick wall of building located across street from MIT Building N51.	9:30 - 9:40am	Cloudy	240 second concurrent exposure	
	2.	TR. OCT 13, 2005	Camera was placed horizontally against same surface as Test 1 (Oct 13, 2005)	9:50 - 9:55am	Cloudy	240 second concurrent exposure	
	3.	TR. OCT 13, 2005	Camera was place vertically against same surface as Test 1 and 2 (Oct 13, 2005)	9:55 - 10:00am	Cloudy	300 second exposure	No Image due to error in camera construction. (Light Leak)
	4.	TR. OCT 13, 2005	Same as Test 3 (Oct 13, 2005)	10:10 - 10:15pm	Cloudy	300 second exposure	Three sheet paper test. (Light Leak fixed)
	5.	TR. OCT 13, 2005	Kenmore Square, west side of square in center medium between Beacon Street and Commonwealth Ave. 	3:00 - 3:30pm	Cloudy with Wind	Individual exposure times, 135 seconds each	
	6.	TR. OCT 13, 2005	Sames location as Test 5. (Oct 13, 2005) Pinhole (a) was alligned with Common-wealth Ave facing west. 	3:00 - 3:30pm	Cloudy with Wind	Individual exposure times, 135 seconds each	
	7.	TR. OCT 13, 2005	Camera was placed vertically on side-walk located on Northern side of Com-monwealth Ave in front of Kenmore Square Portal. 	3:00 - 3:30pm	Cloudy with Wind	135 second concurrent exposure	
	1.	W. OCT 19, 2005	Outside of MIT building N51, across street next to Cambridge Bicycle. Camera was placed on sidewalk surface. Pinhole (a) was aligned with Mass Ave facing north. 	12:50 - 1:00pm	Partly Cloudy	a: 12 second exposure b: 15 second exposure c: 18 second exposure d: 21 second exposure e: 24 second exposure	Individual exposures
	2.	W. OCT 19, 2005	Same location as Test 1, (Oct 19, 2005) Camera was oriented opposite previous test. Pinhole (d) was aligned with Mass Ave facing north. 	1:20 - 1:30pm	Partly Cloudy	a: 50 second exposure b: 60 second exposure c: 70 second exposure d: 80 second exposure e: 90 second exposure	Individual exposures
	3.	W. OCT 19, 2005	Kenmore Square: camera was located at the temporary bus platform, aligned with the curb.	3:15 - 3:30pm	Partly Cloudy	15 minute exposure	First test with this camera. Exposure time needs to be corrected.
	4.	W. OCT 19, 2005	Kenmore Square: Camera was placed flat on sidewalk near temporary bus platform. 	3:40 - 3:45pm	Partly Cloudy	120 second concurrent exposure	
	5.	W. OCT 19, 2005	Kenmore Square: Camera was located at west side of Kenmore square at the medium of Commonwealth Ave. Pinhole (a) was aligned with Commonwealth facing west. 	3:45 - 3:50pm	Partly Cloudy	individual 90 second exposure	Exposure time needs to be cor-rected. Concurrent exposure works better.

CAMERA	TEST	DATE	LOCATION		TIME	WEATHER CONDITIONS	EXPOSURE TIME	NOTES
	6.	W. OCT 19, 2005	Camera was placed at curb facing across Kenmore Square towards Brookline Ave from Medium of Commonwealth Ave. Camera was located at surface directed facing crosswalk.		3:55 - 4:00pm	Partly Cloudy	300 second concurrent exposure	No Image due to error in camera construction occuring on site. (Light Leak)
	7.	W. OCT 19, 2005	Camera was located at same location and orientation as Test 5 (Oct 19, 2005)		5:00 - 5:05pm	Partly Sunny	Individual 45 second exposure	Low sun angle resulted in over exposure in a portion of the image
	8.	W. OCT 19, 2005	Kenmore Square: Camera was located at the medium of Commonwealth Ave facing east towards Boston. Camera was loacted at surface with a 2 x 4 support.		5:05 - 5:10pm	Partly Sunny	300 second exposure	Three sheet paper test. (Light Leak fixed)
	9.	W. OCT 19, 2005	Camera was located at same location and orientation as Test 4 (Oct 19, 2005)		5:10 - 5:15pm	Partly Sunny	120 second concurrent exposure	
	1.	TR. OCT 20, 2005	Sames location as Test 4 and 9. (Oct 19, 2005). Camera was first located horizontal to the sidewalk and the photo was exposed. Then a second exposure was taken with camera located vertically.		9:30 - 9:35am	Sunny	60 Second concurrent exposure for each position.	
	2.	TR. OCT 20, 2005	Camera located at the five medium points of the intersection of Commonwealth, Brookline, and Beacon Street. (see site diagram)		9:35 - 9:40am	Sunny	a, b, c: 45 second individual exposures d, and e: 90 second exposures	Image was flawed due to camera operator error. One pinhole was exposed twice, one oinhole was never exposed
	3.	TR. OCT 20, 2005	Located at same location as Test 5 and 7 (October 19, 2005)		9:45 - 9:50am	Sunny	90 second individual exposure	
	4.	TR. OCT 20, 2005	Camera was located to the east of the Kenmore T Stop near Temporary bus platform. Camera was aligned with the Entrance to the T Station with a row of Newspaper bins to the right of the camera.		9:55 - 10:00am	Sunny	300 second concurrent exposure	
	5.	TR. OCT 20, 2005	Camera located and oriented same way as Test1 (Oct 20, 2005) Two different exposures taken.		12:50 - 1:00pm	Partly Cloudy	90 Second concurrent exposure for each position.	
	6.	TR. OCT 20, 2005	Camera located at same points as Test 2 (Oct 20, 2005)		1:00 - 1:10pm	Partly Cloudy	a, b, c: 45 second individual exposures d, and e: 90 second exposures	
	7.	TR. OCT 20, 2005	Located at same location as Test 5 and 7 (Oct 19, 2005) and Test 3 (Oct 20, 2005). Image is recorded on side walls compared to cylindar mount, center image.		1:20 - 1:25pm	Partly Cloudy	15 second individual exposures	
	8.	TR. OCT 20, 2005	Camera was located at same position and orientation as Test 4, (Oct 20, 2005)		1:25 - 1:30pm	Cloudy	60 second concurrent exposure	

CAMERA	TEST	DATE	LOCATION		TIME	WEATHER CONDITIONS	EXPOSURE TIME	NOTES
	9.	TR. OCT 20, 2005	Camera located in same position as previous tests 4 and 9 (Oct 19, 2005) and Tests 1 and 5 (Oct 20, 2005) Camera was only exposed in horizontal position.		3:30 - 3:35pm	Cloudy	60 second concurrent exposure	
	10.	TR. OCT 20, 2005	Located at same location as Test 5 and 7 (Oct 19, 2005) and Test 3 and 7 (Oct 20, 2005). Image is recorded on side walls compared to cylindar mount, center image, similar to Test 7 (Oct 20, 2005)		3:35 - 3:40pm	Cloudy	30 second individual exposures	Camera construction error, light leak developed on site. Image over exposed, no image recorded
	11.	TR. OCT 20, 2005	Camera was located at same position and orientation as Test 8, (Oct 19, 2005)		4:30 - 4:35pm	Sunny	60 second concurrent exposure	
	12.	TR. OCT 20, 2005	Camera located at same position as Tests 5 and 7 (Oct 19, 2005) and Tests 3 and 7 (Oct 20, 2005)		4:45 - 4:50pm		15 second individual exposures additional 15 seconds for pinholes (d) and (e) because of shade	This would have been a more succesful shot had I not decided to added th additional exposure time.

CAMERA ANALYSIS


TEST 5. (OCT 13, 2005)
TEST 6. (OCT 13, 2005)
TEST 12. (OCT 20, 2005)
TEST 7. (OCT 20, 2005)
TEST 9. (OCT 20, 2005)
TEST 11. (OCT 20, 2005)
TEST 4. (OCT 13, 2005)

PROGRAMATIC CONDTIONS

The development and analysis of the camera devices revealed four specific conditions that could be used to alter the image result, revealing different experinces of the site captured by the pinhole camera devices. The specific design qualities of the camera influences the resulting image and the specific qualities found in the image.

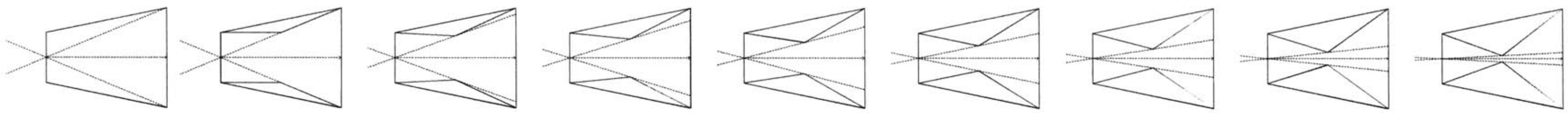
ABOVE / BELOW: If the film plane is skewed at a certain angle, the image will be skewed. If there are two apertures on each side of the skewed film plane, then one side of the film plane will capture an image above the horizon line and the other side will capture below the horizon line.

APERTURE / HORIZON: By narrowing the distance that the image is allowed to pass through the horizon line is captured at a greater intensity. If the camera is rotated at 90 degress, a narrow aperture reveals a specific portion of the image.

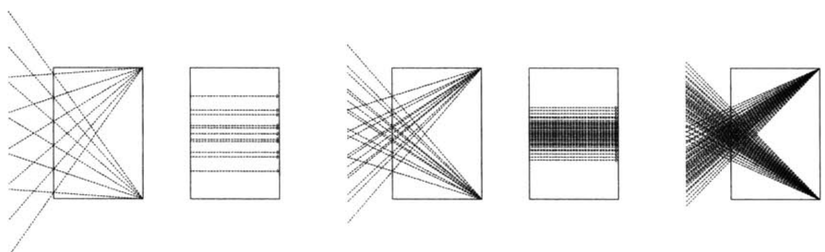
PERSPECTIVE / REPETITION: Each aperture reveals an image from a specific point. Multiple apertures spaced a certain distance apart reveals multiple images from different station points, a repetition of different perspectives.

DISTANCE / THRESHOLD: If you increase the distance between the aperture and the film plane, you decrease the angle of view and if you decrease the size of the film plane, you also decrease the angle of view.

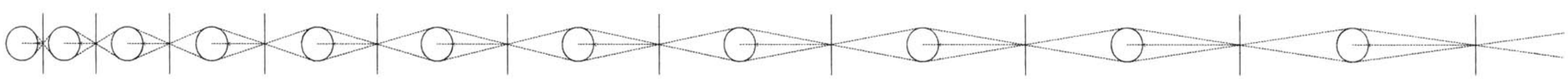
ABOVE / BELOW



APERTURE / HORIZON



PERSPECTIVE / REPETITION



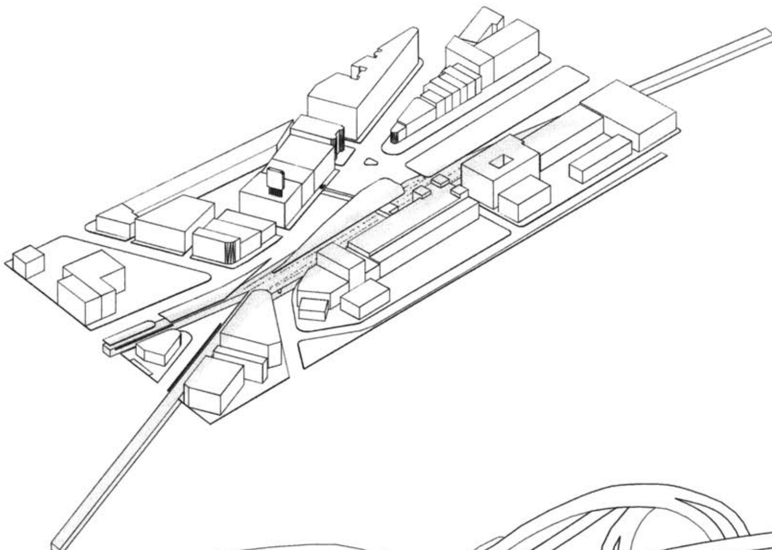
DISTANCE / THRESHOLD

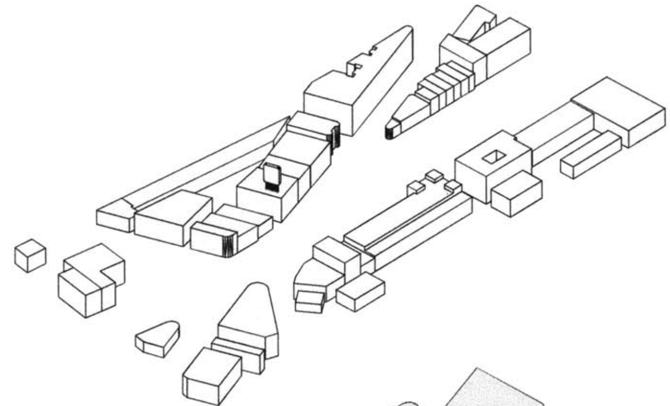
SITE DOCUMENTATION

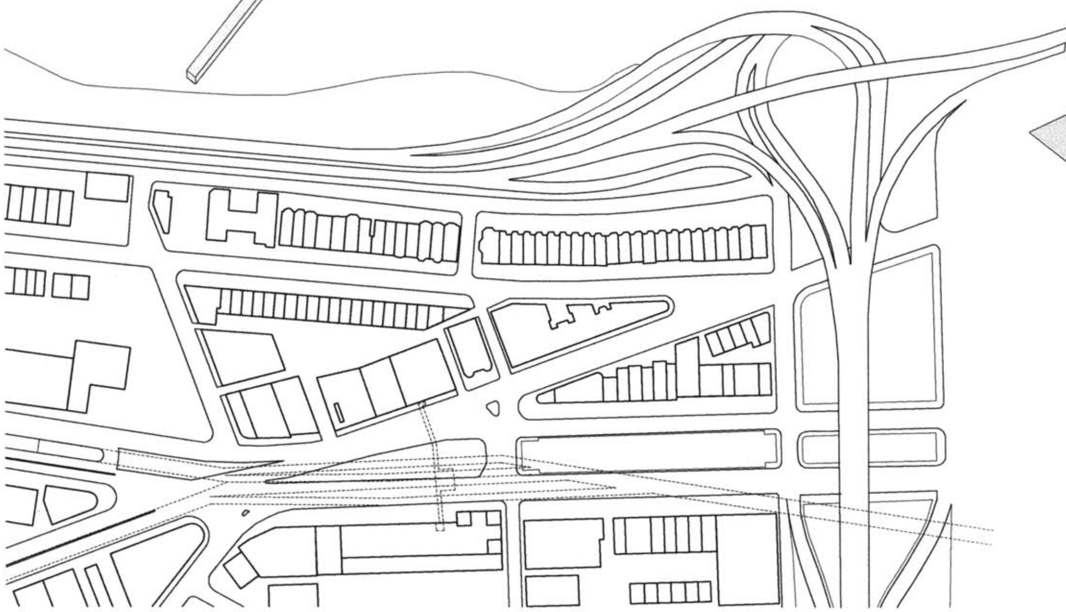
Throughout the thesis process a constant internal battle took place regarding site. This investigation is, at one sense site-less. What I mean by this is that this investigation could take place in any urban and perhaps suburban place. At the same time a specific site enhances the design and development process of the pinhole cameras, thus strengthening the project. From the beginning I was interested in an urban area that held a strong identity, a focal point of the surrounding urban environment. I was also interested in the uncertain spaces of the cities, the dead or lost spaces that hold there own internal identity. I found both of these conditions within Kenmore Square in Boston Massachusetts.

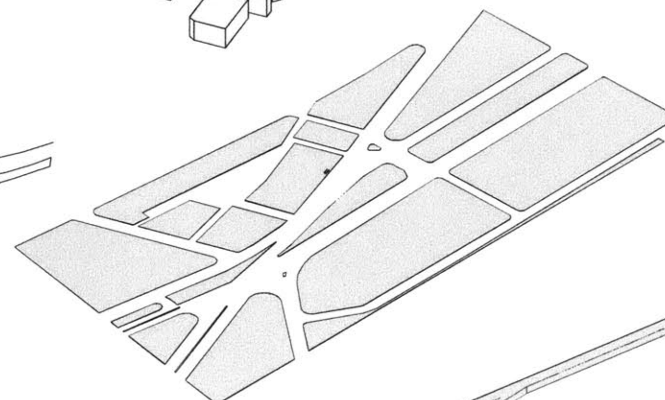
Kenmore Square is a unique intersection in the Back Bay of Boston. It sits at the convergence of three major roadways, Beacon Street, Brookline Avenue, and Commonwealth Ave. The streets intersect each other at acute angles and at the center of this intense intersection is a bus depot. The area is home to a number of school institutions, retail and commercial spaces as well as housing. The most unique feature of the intersection is the gigantic Citgo sign which sits on the roof of the former Peerless Auto Sales and Services Building at 660 Beacon Street. The 360 square foot sign is seen from miles away including from the batters box at Fenway square. The sign orients residents and visitors within this area, acting as a compass for the city. Kenmore square proved to be an interesting site for this investigation because of recognizable features at the intersection, including the famous Citgo sign. The Citgo sign is just one example that demonstrates the important role transportation plays at Kenmore Square.

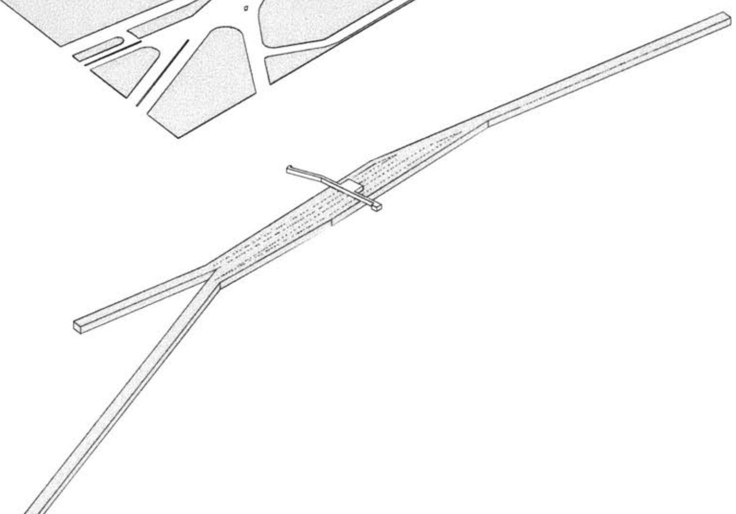
At the time of this investigation a new bus shelter was under construction and scheduled to be completed at the end of 2006. A temporary bus shelter has been constructed along Beacon Street in front of the Barnes and Noble Book Store. A number of Bus lines converge at this point. Below the bus shelter at the center of the intersection is the Kenmore Square T-Stop on the Green Line. Two separate subway lines, the B and C, converge at Kenmore Square from the west and descend east towards downtown Boston.

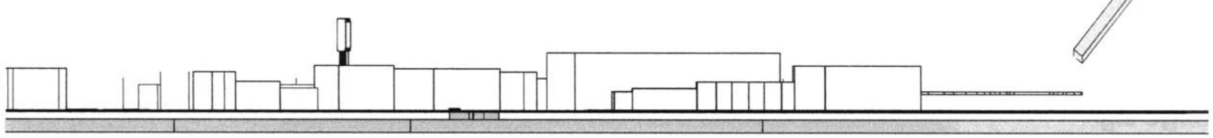












Right: Aerial photography of Kenmore Square, Fenway park can be seen at bottom of photo.

Opposite: Pinhole image of the famous Citgo Sign


CITGO
FOLEY ELECTRIC
Now taking reservations for October
BERTUCCI'S
OF PHOTOGRAPHY

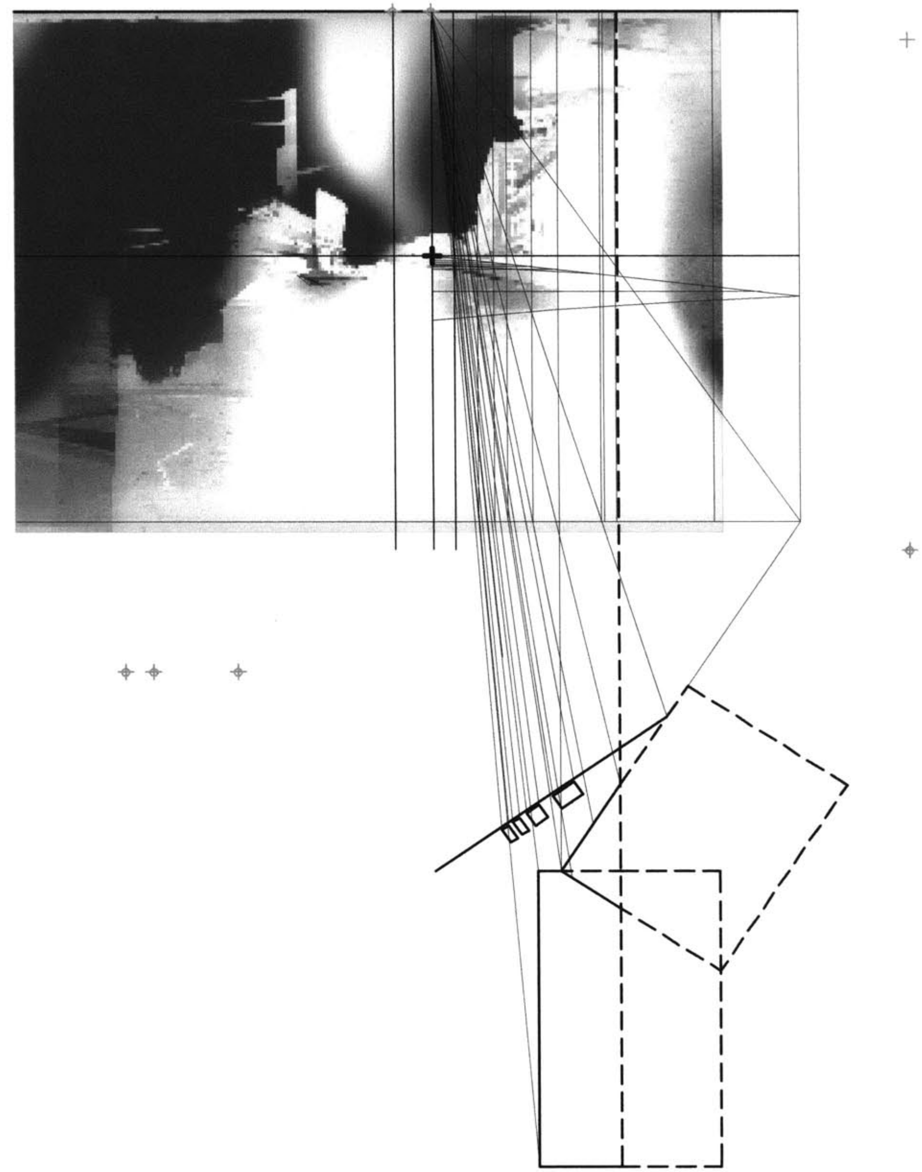
IMAGE RECONSTRUCTION

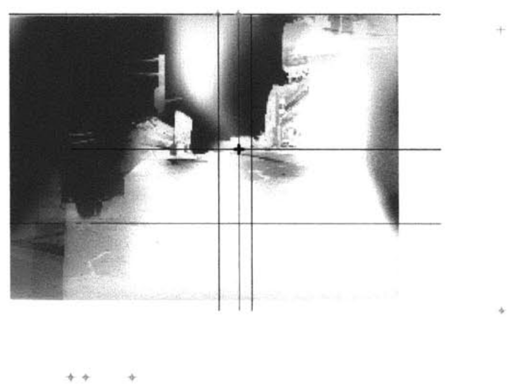
Three images from the pinhole cameras were analyzed by constructing reverse engineered perspectives. Each image represents a new representation of the existing site. The plan of the new representation is drawn by reverse engineering the multiple perspectives. Each image is first analyzed. There are four qualities that the image reconstruction reveals.

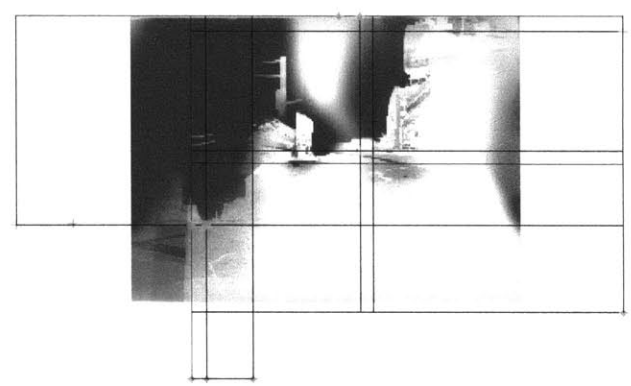
1. Ground plane location in relationship to the horizon line
2. The overlapping space found in the image.
3. The image Density
4. Ephemeral Space (the non-existent image)

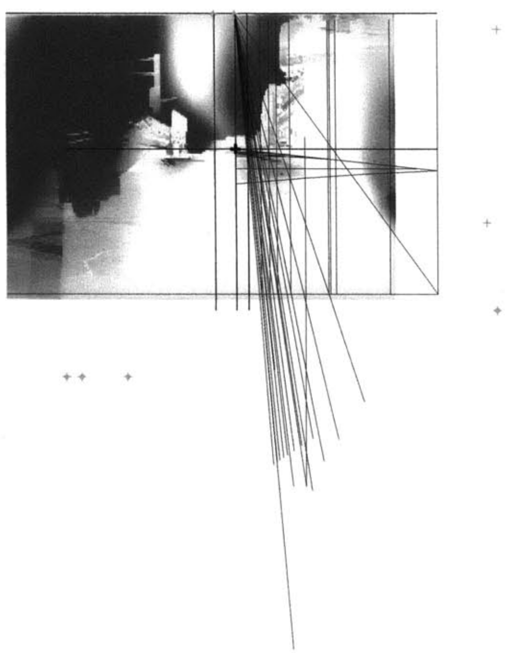
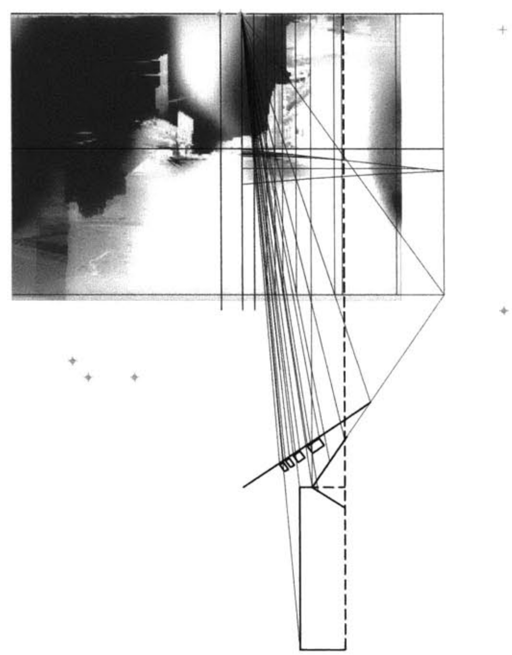
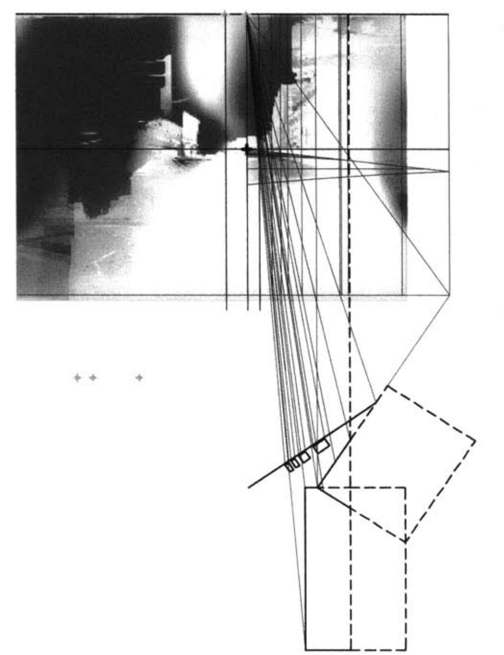
Using traditional methods of perspective drawing and working backwards, I was able to reconstruct each image into a plan representing the existing site experienced through the pinhole camera device. The new plans are represented as line drawings superimposed over the image and as black and white collages. The layering of information on these collages determines the spatial qualities of the new representation of the site. These spatial qualities are evident in the THREE-DIMESIONAL STUDIES of the reconstructed image plan.

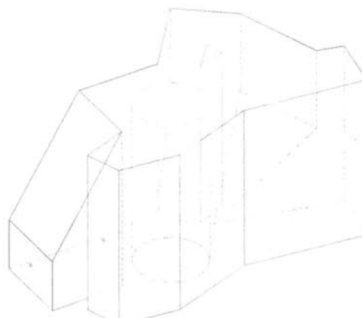
The original pinhole image is deconstructed. Each vanishing point and horizon line is superimposed over the original pinhole photograph. The station point is plotted using the camera position on the site and the focal length of the camera aperture; the distance between the aperture and the film plane. Specific aspects of each image such as buildings and curbs are then plotted using perspective techniques. Information in the images is limited. For example, one image shows a façade of a building, but nothing more. Once that façade is plotted in the plan, its length is given. By comparing the length of the "new" façade to the existing façade, the buildings scale can be represented in the "new" plan.





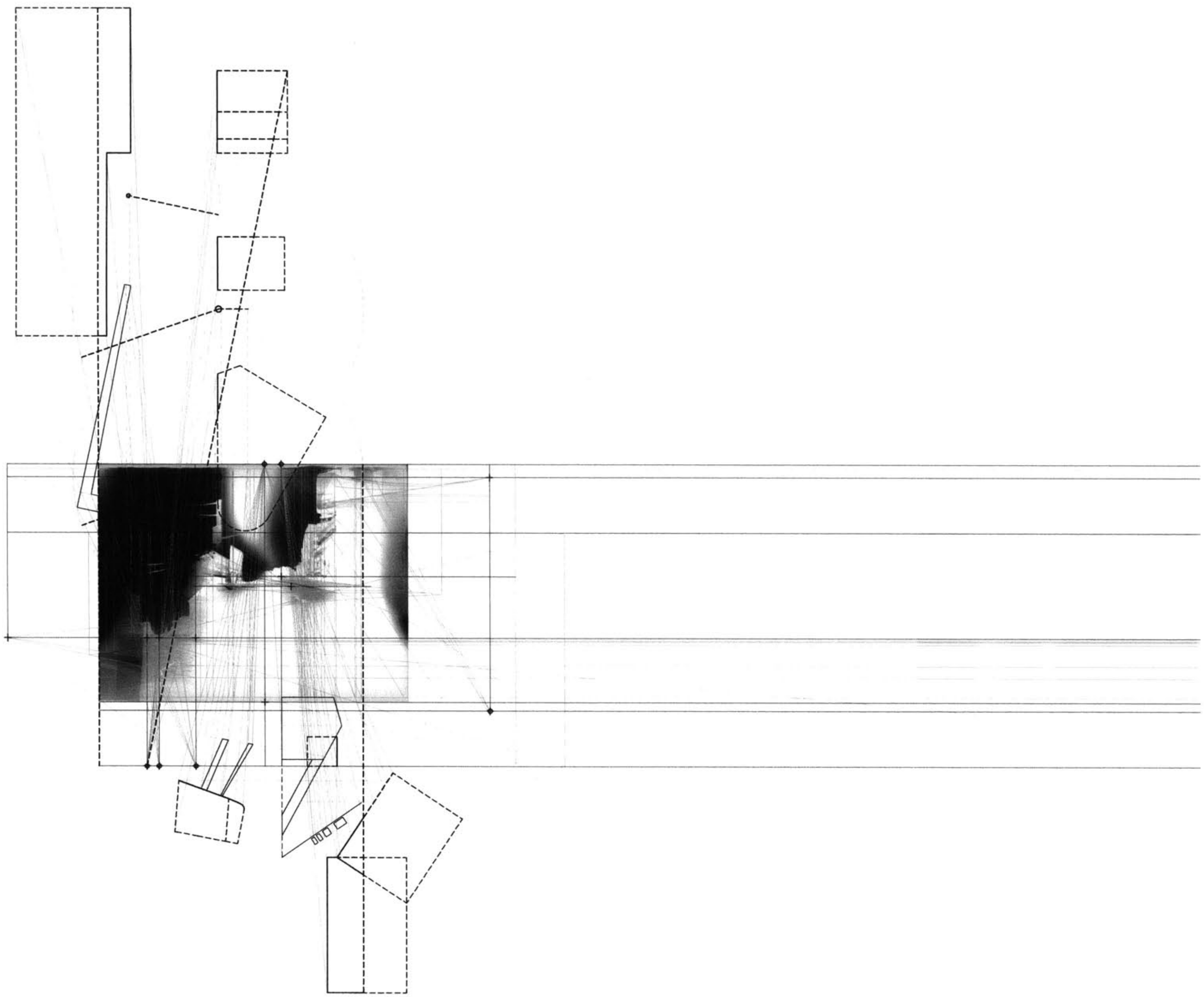


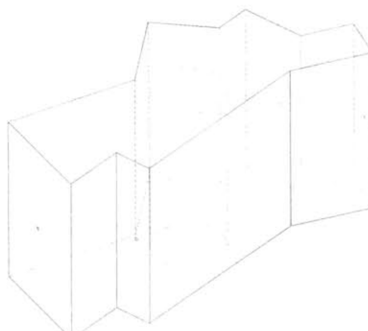






K-2A: The geometry of this camera is derived from the site lines found at Kenmore Square. The shape of the camera is a result of this geometric analysis. The image is captured on 11" x 14" paper located at the center of the camera.

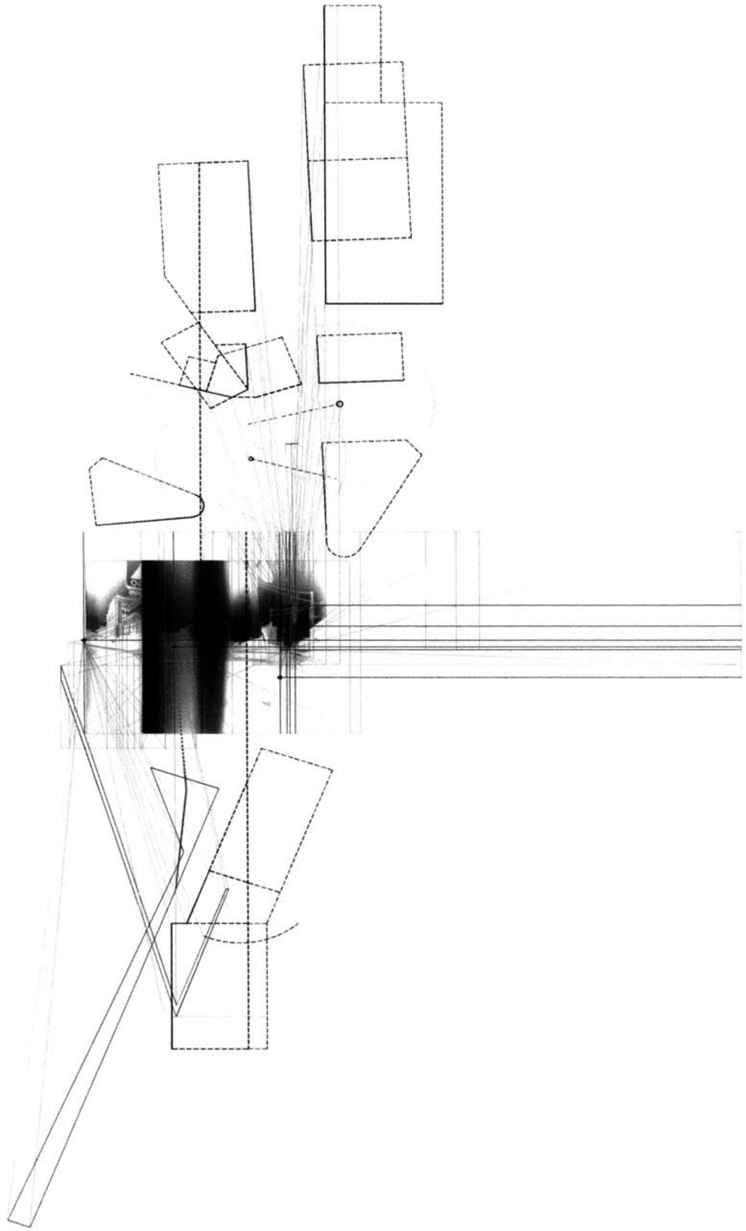
TEST 6. (OCT 13, 2005)

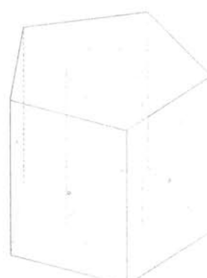




K-3A: Similar in shape to K-2A, this camera is also derived from a geometric analysis of Kenmore square. However it is designed for two different image capture configurations. In this setup the image is captured on one 11" x 14" paper located at the center of the camera.

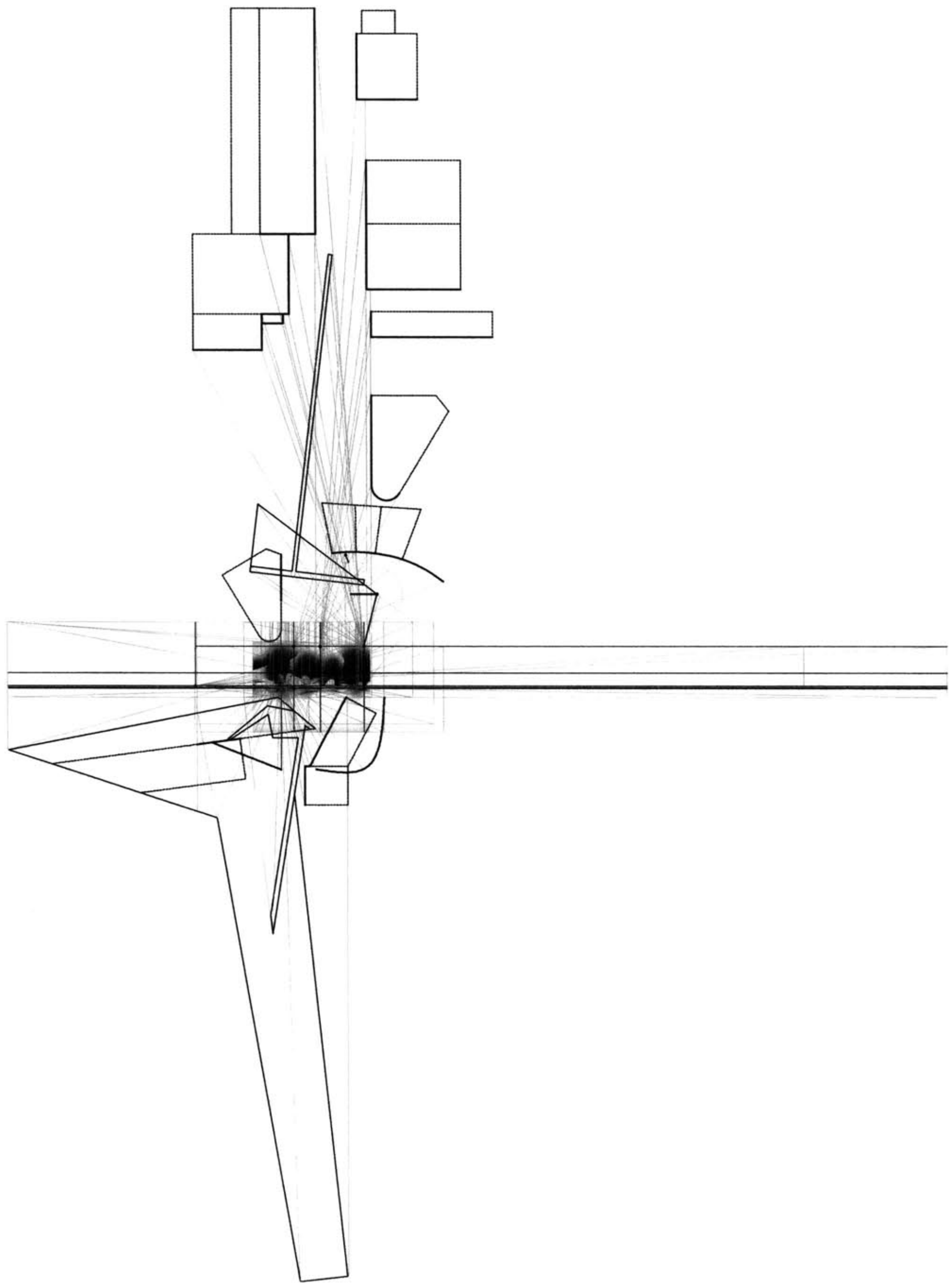
TEST 12. (OCT 20, 2005)



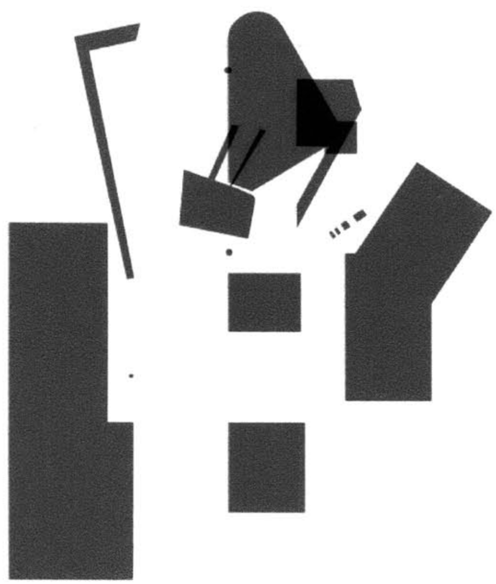


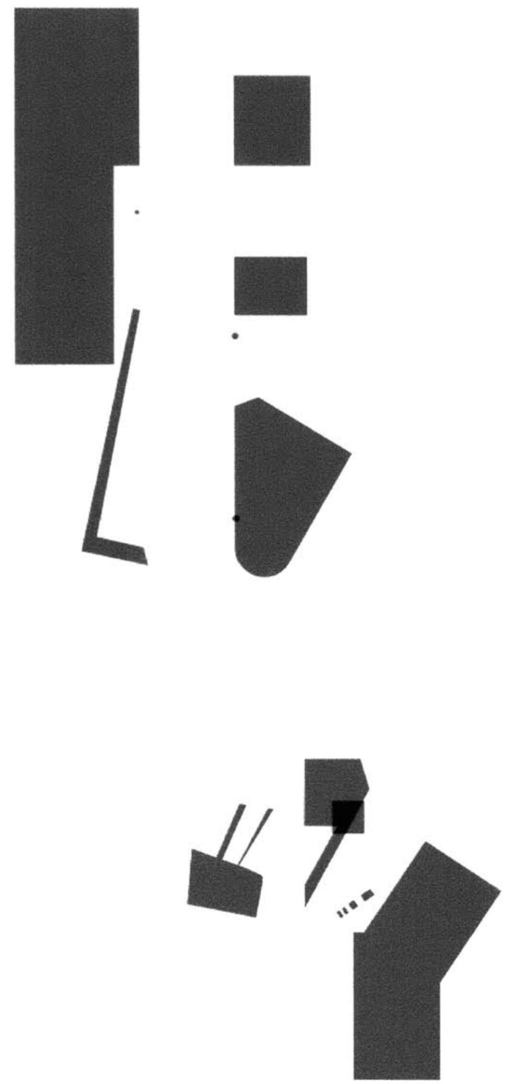
K-1A: Pentagon shaped control camera with five pinholes each with equal diameter and focal length. Camera captures a 360 degree image on 11" x 14" paper located at the center of the camera.

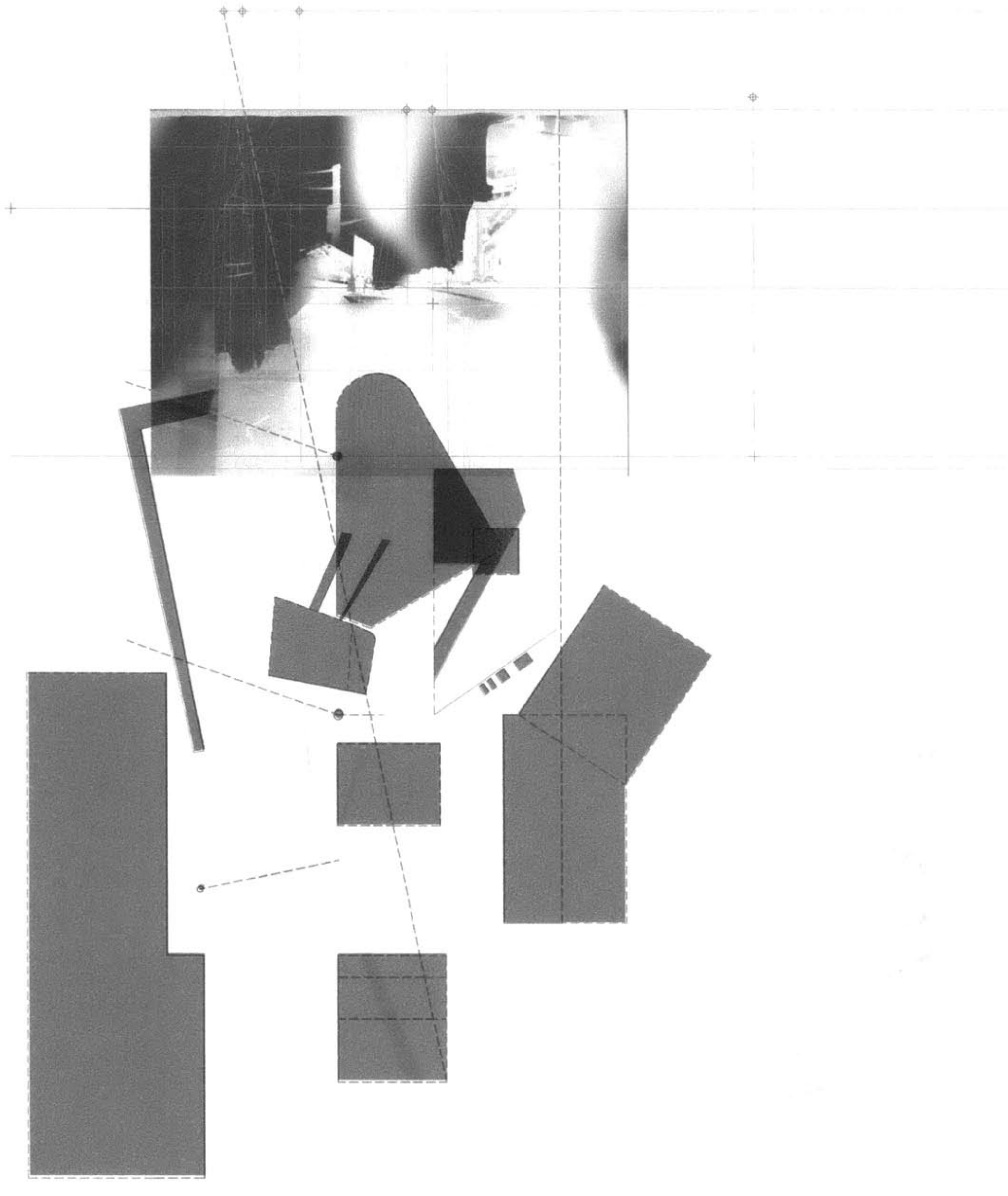
TEST 5. (OCT 13, 2005)

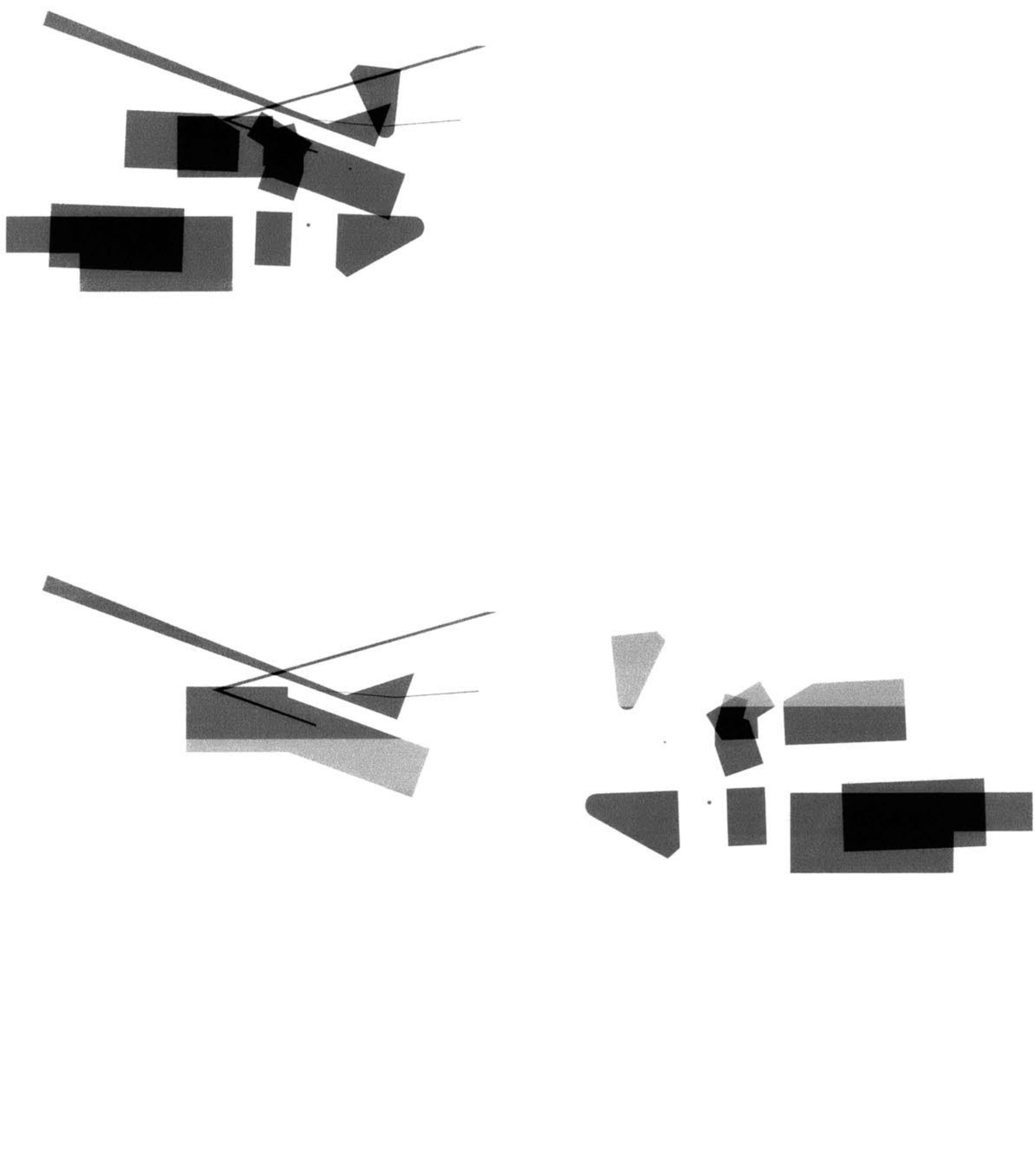


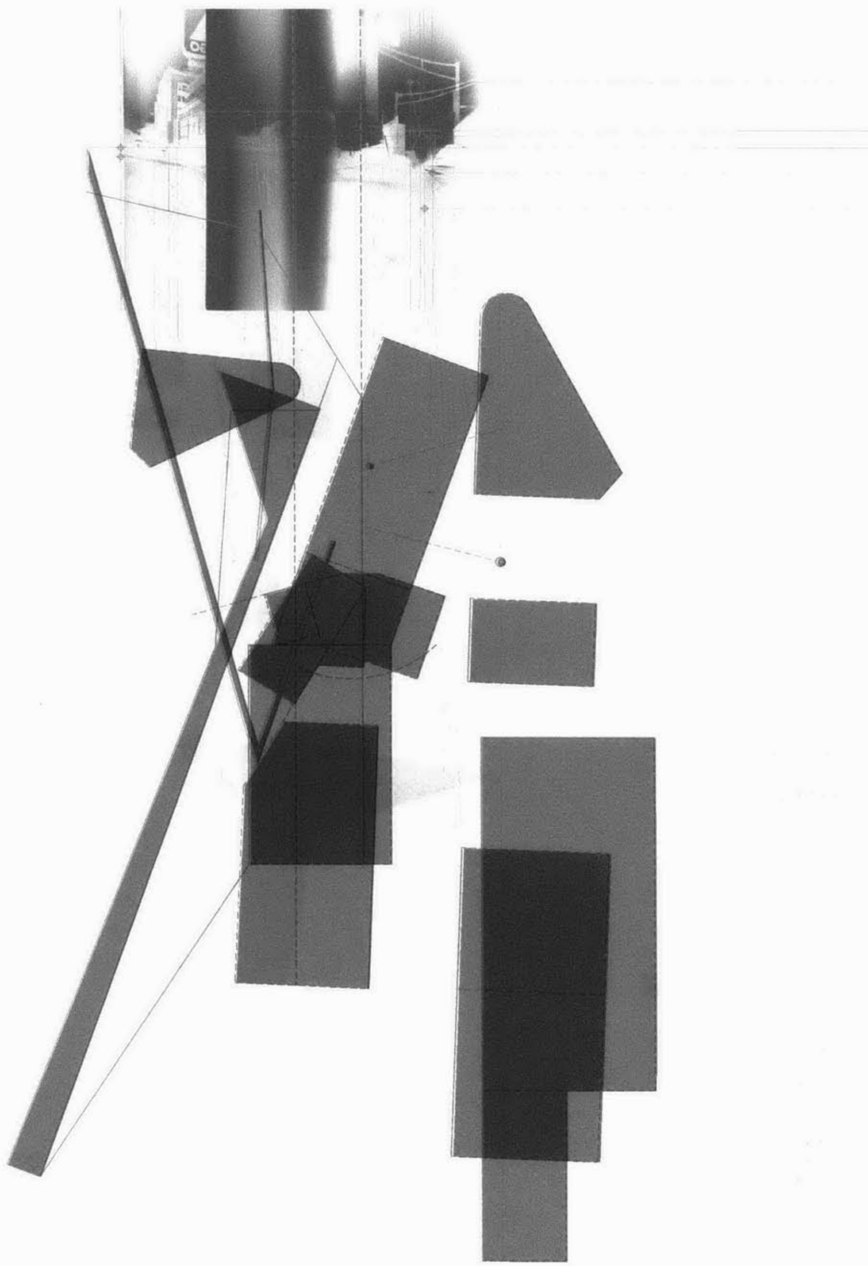
COLLAPSED COLLAGE STUDIES

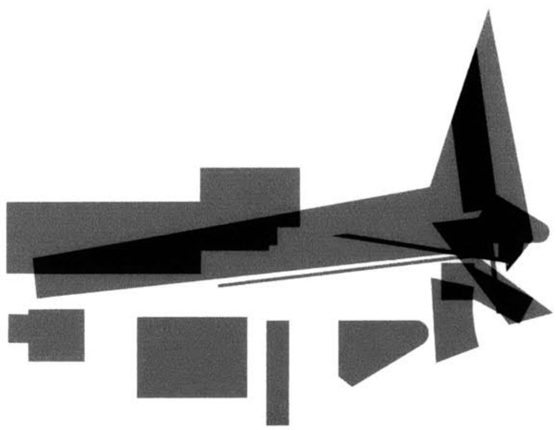


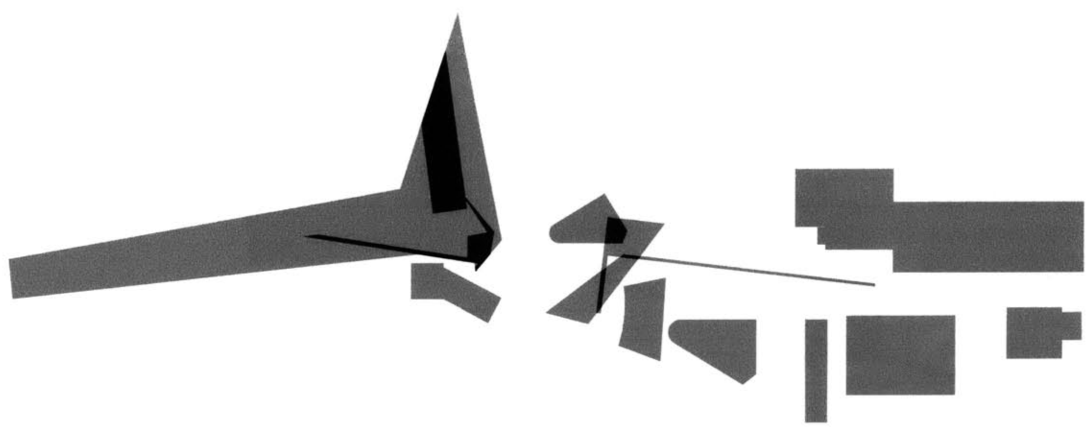


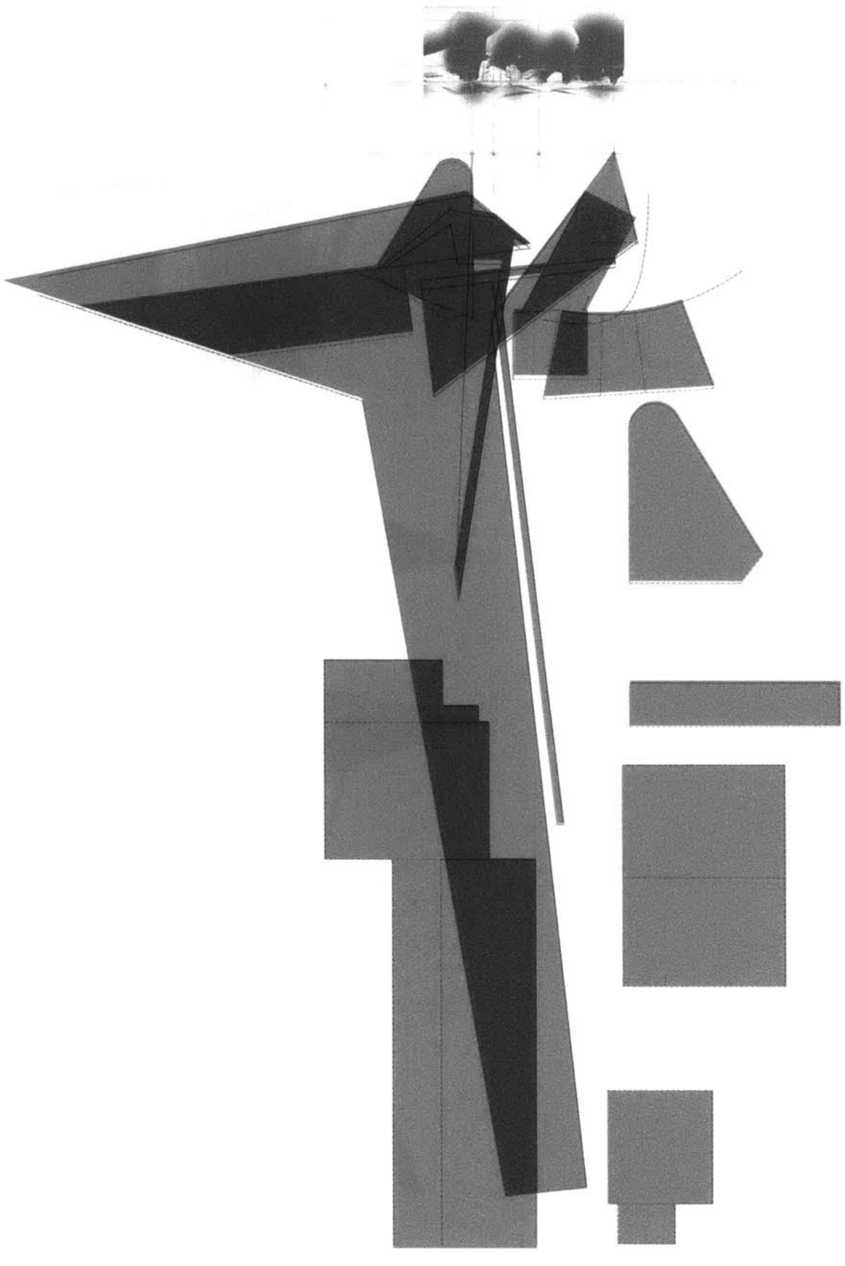


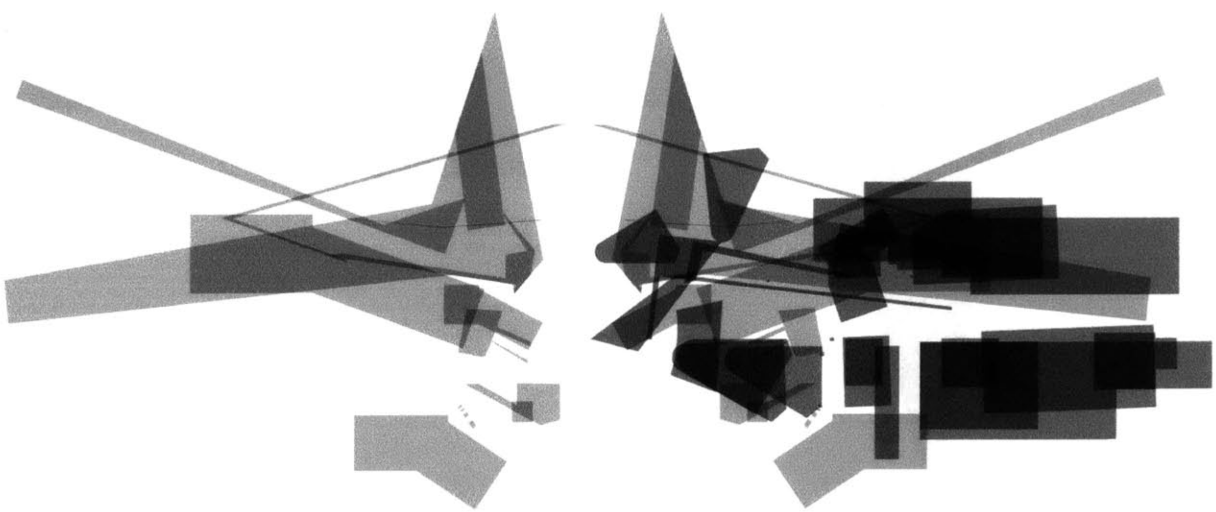


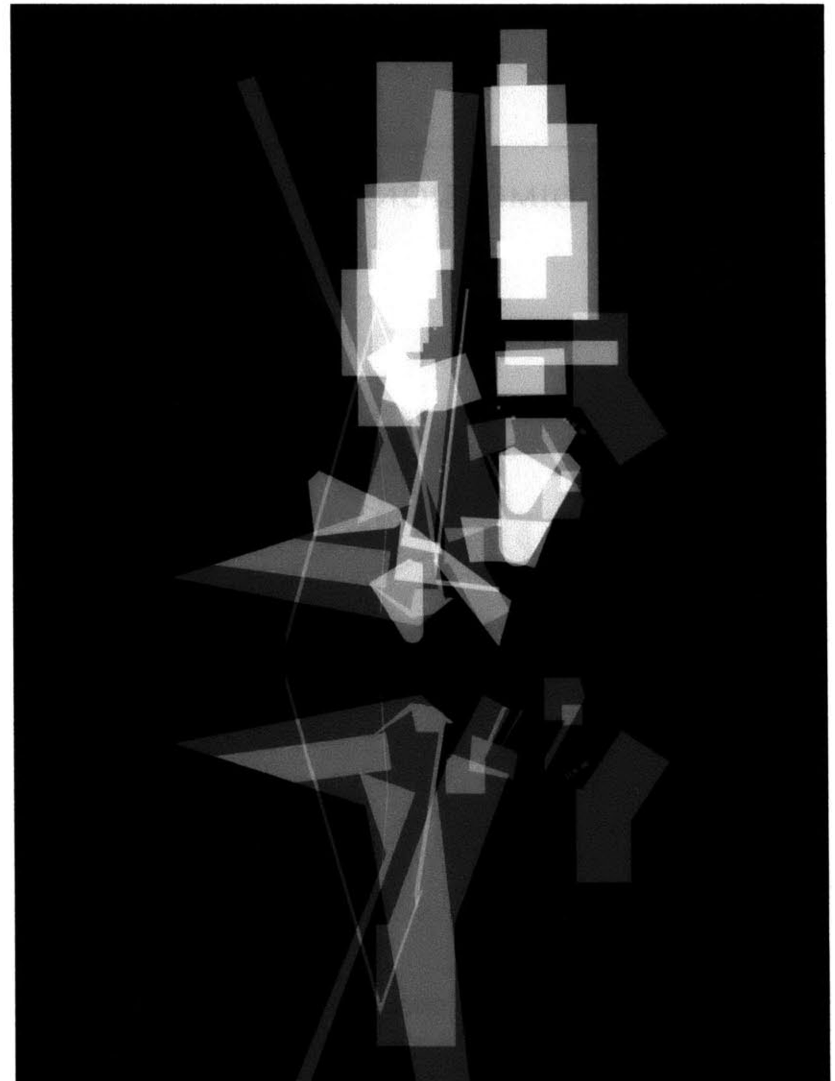




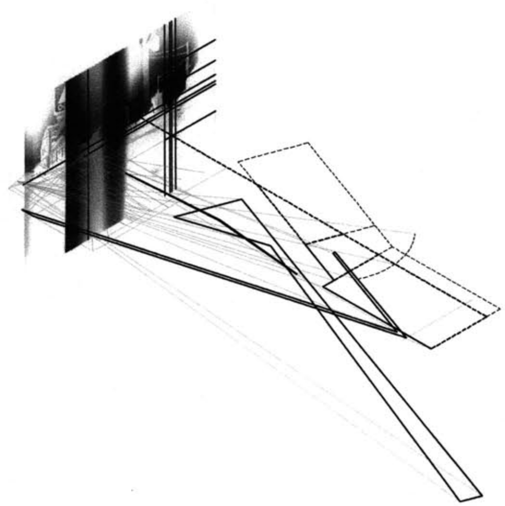


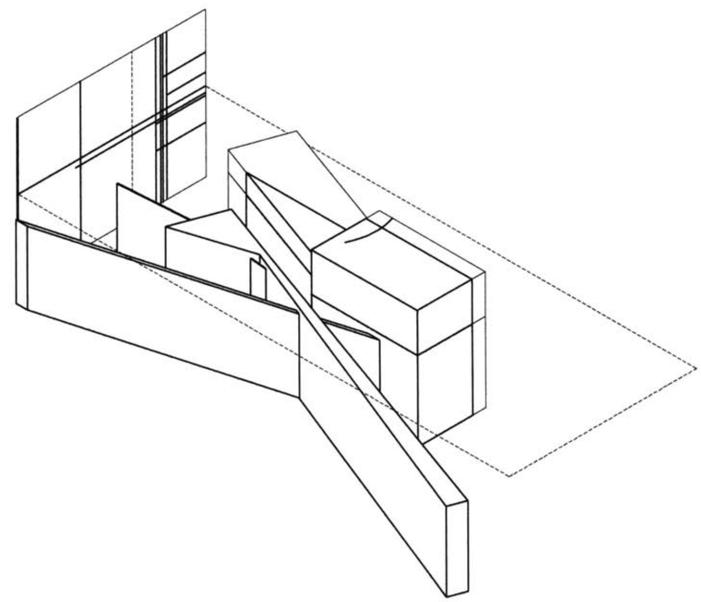




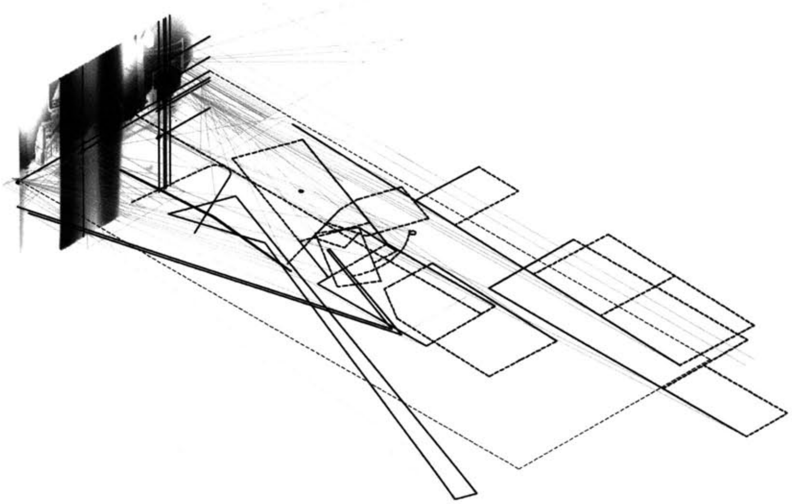


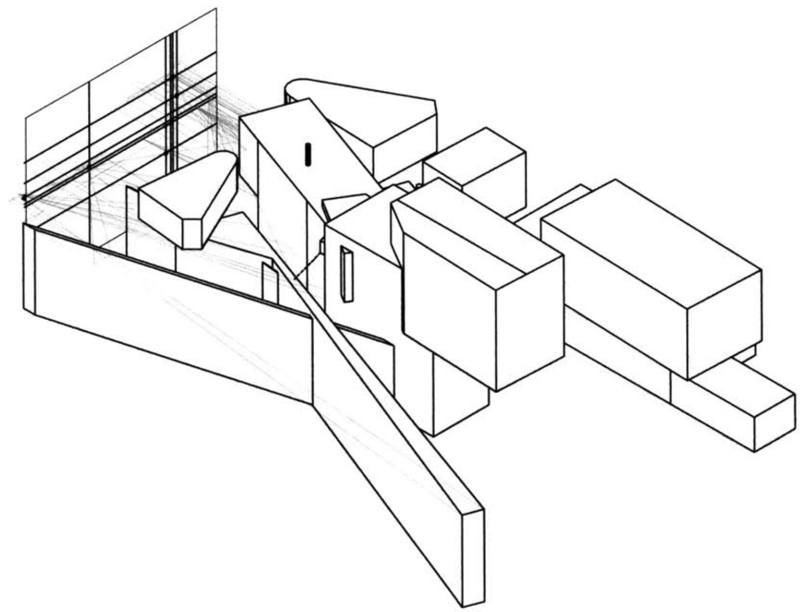
THREE-DIMENSIONAL URBAN STUDIES



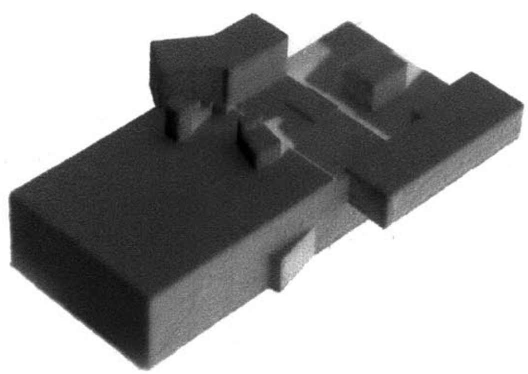


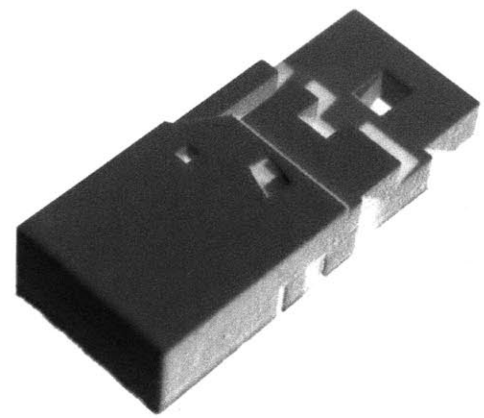
The image contains multiple perspectives each with its own horizon line. The elevation of each horizon is plotted in three-dimensional space. The spatial form is constructed in proportion to the existing site conditions. The multiple perspectives, each with its own horizon line at specific heights relative the zero plane results in a three dimensional overlap of solids and voids that produce spaces of uncertainty.



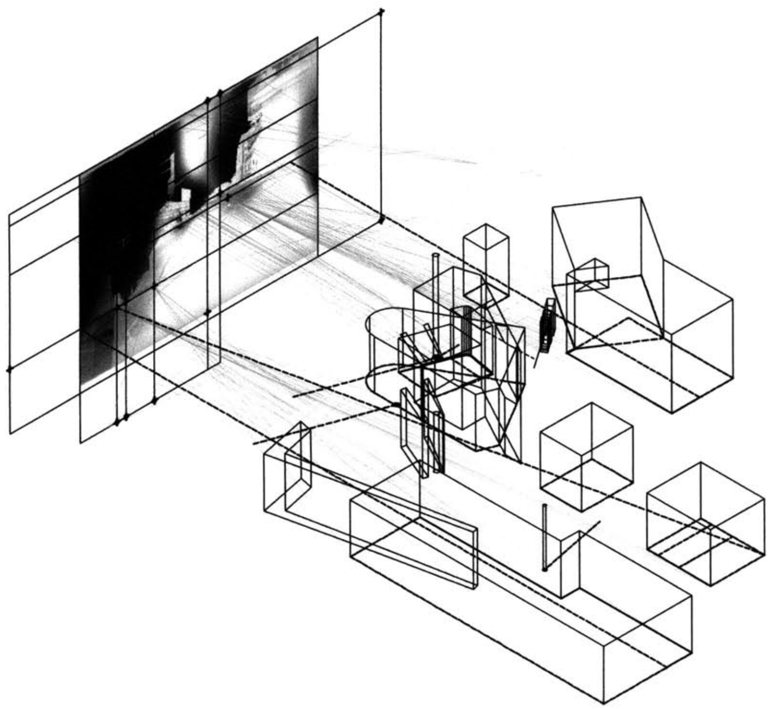


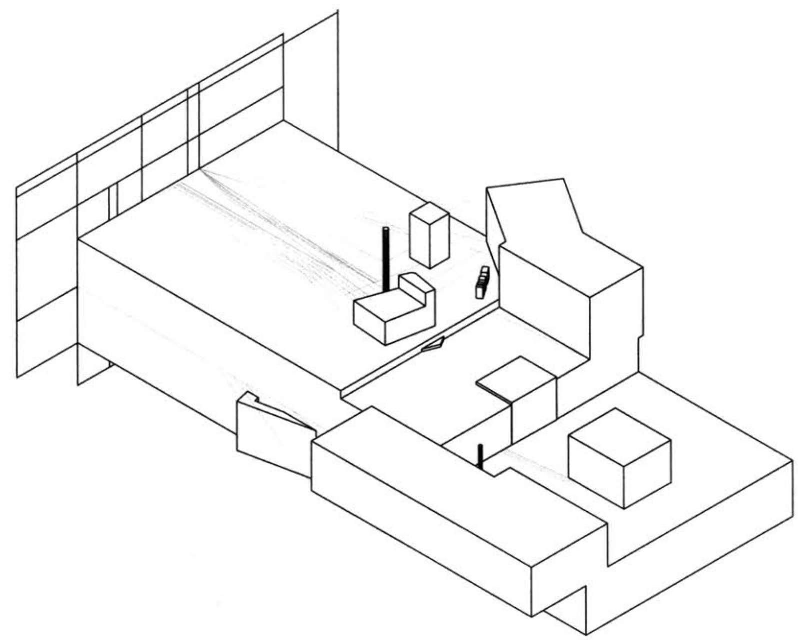
THREE-DIMENSIONAL URBAN STUDIES



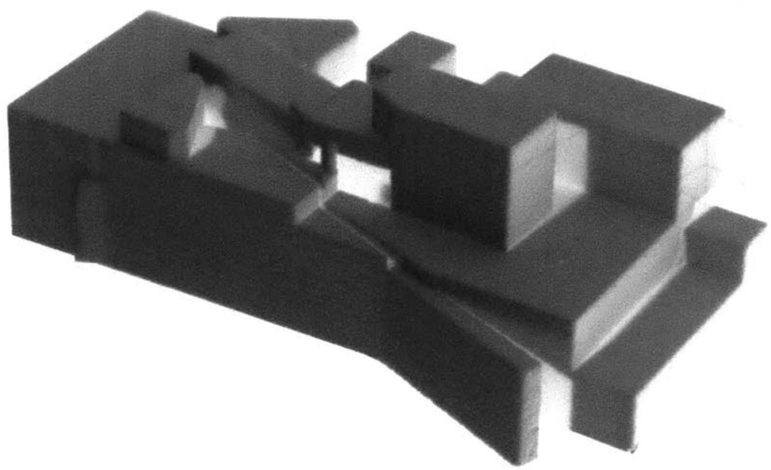


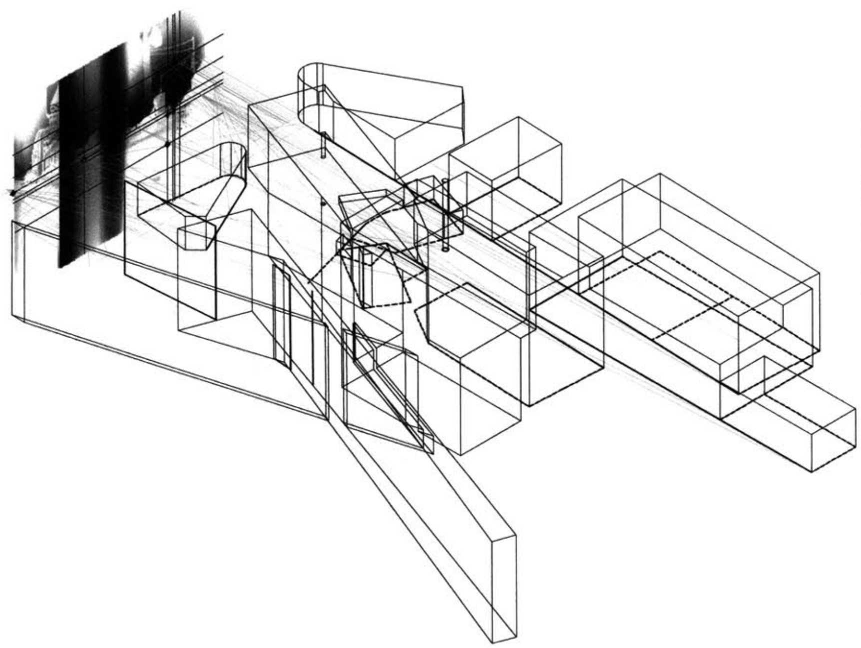
The constructed forms represent the spatial experience of the image generated by the pinhole camera devices. The three-dimensional studies are at an urban scale and they are represented in the form of drawings and (z-corp) printed models. The z-corp printed models display the solid and void characteristics of the constructed forms.

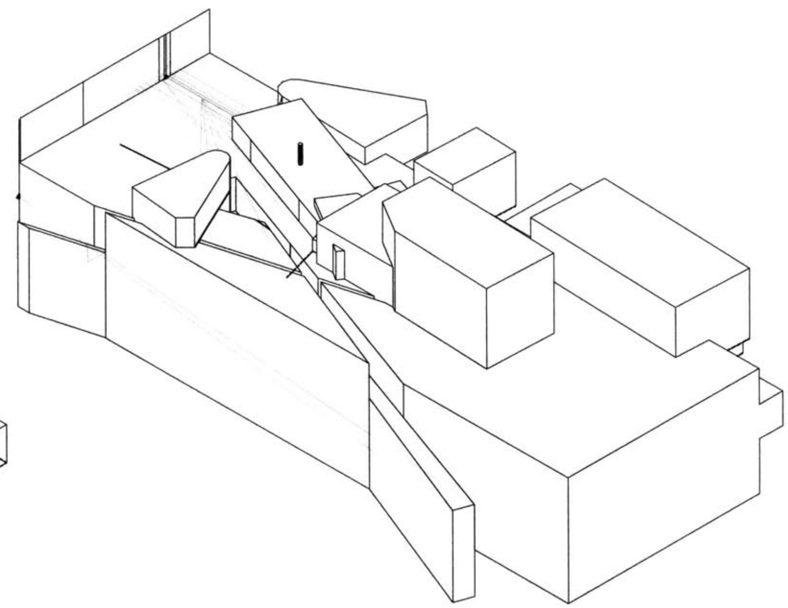




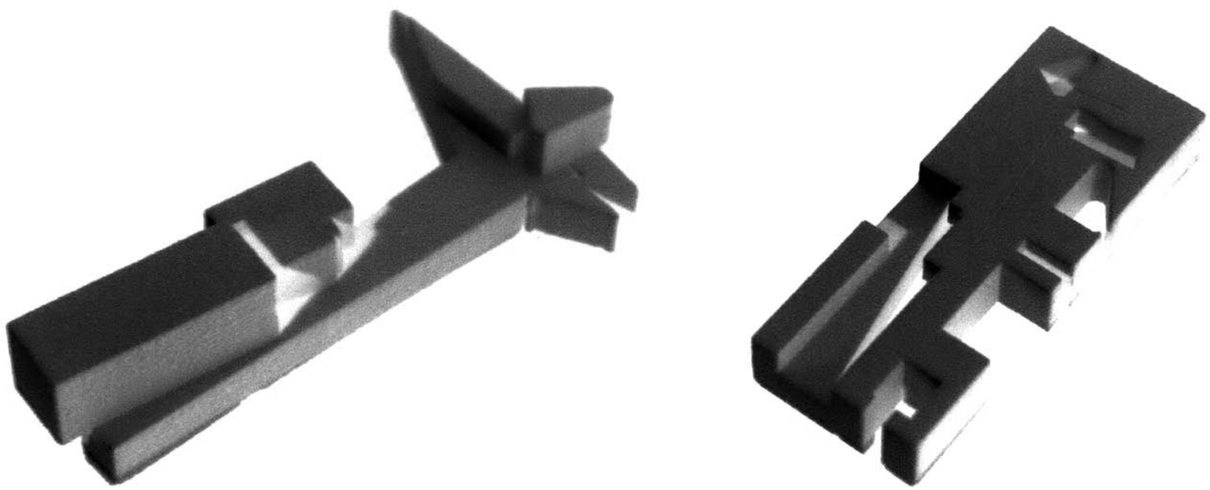
THREE-DIMENSIONAL URBAN STUDIES

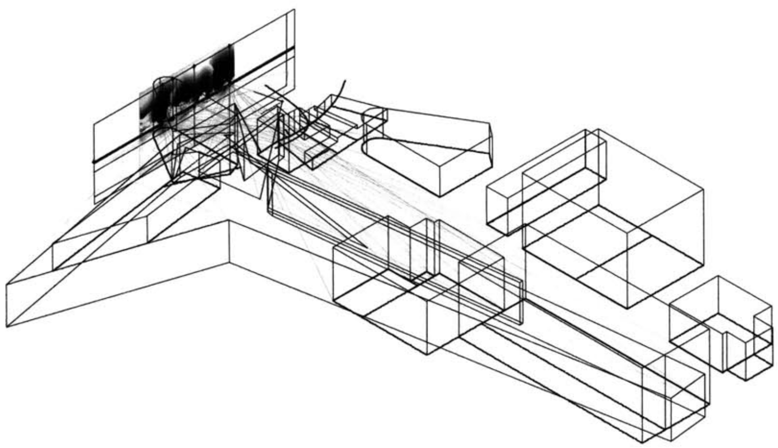


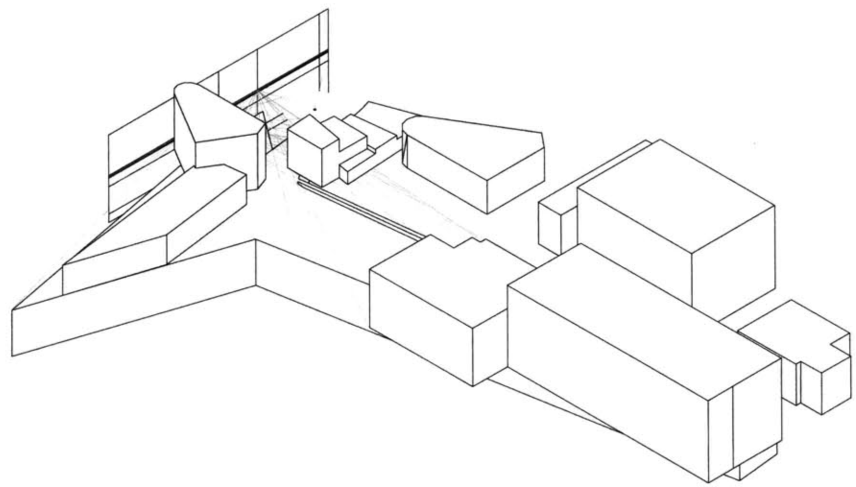




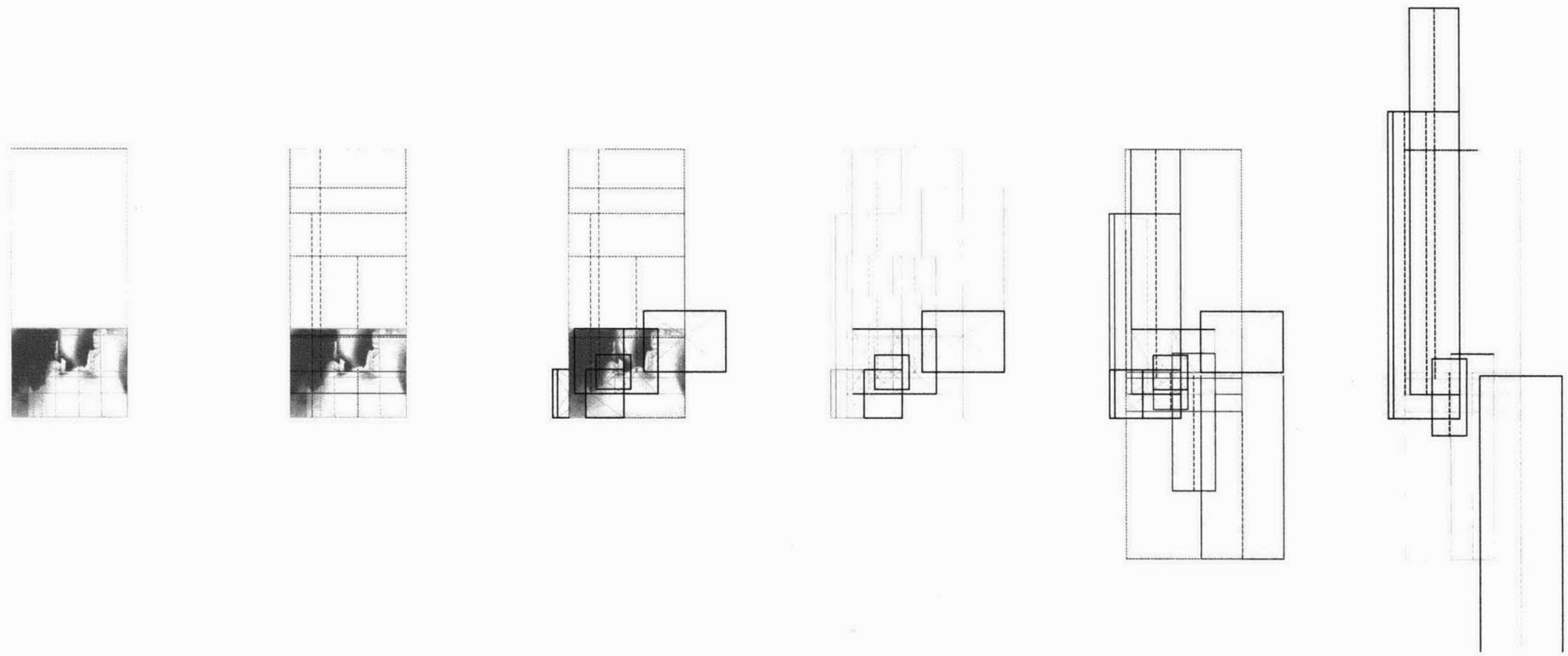
THREE-DIMENSIONAL URBAN STUDIES



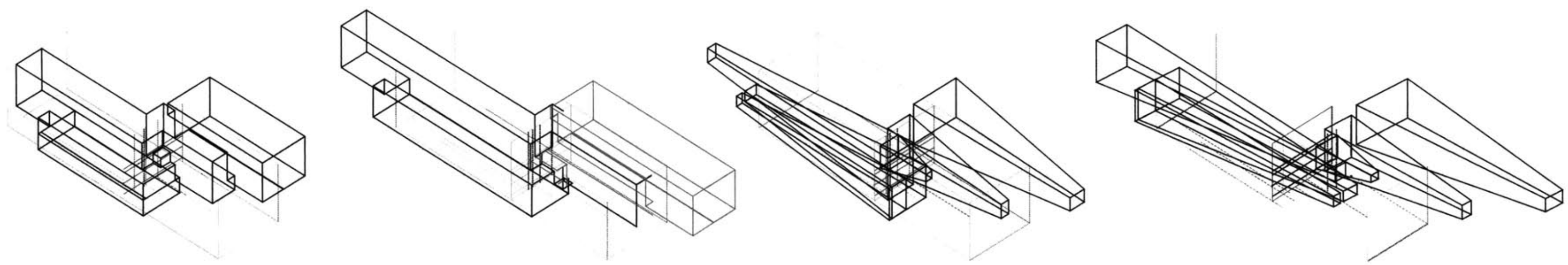




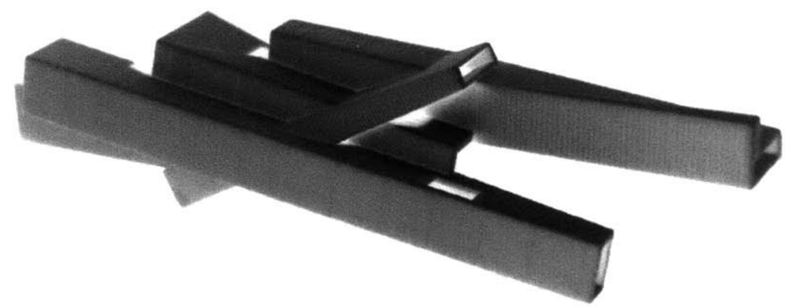
SPATIAL DEVELOPMENT



The development of spatial form is the result of an analysis of the pinhole images. Taken as an example, one of the pinhole images is divided into parts, each part representing one perspective from a specific station point at a certain height above the ground plane. The intersection of these multiple perspective planes generates a spatial experience.



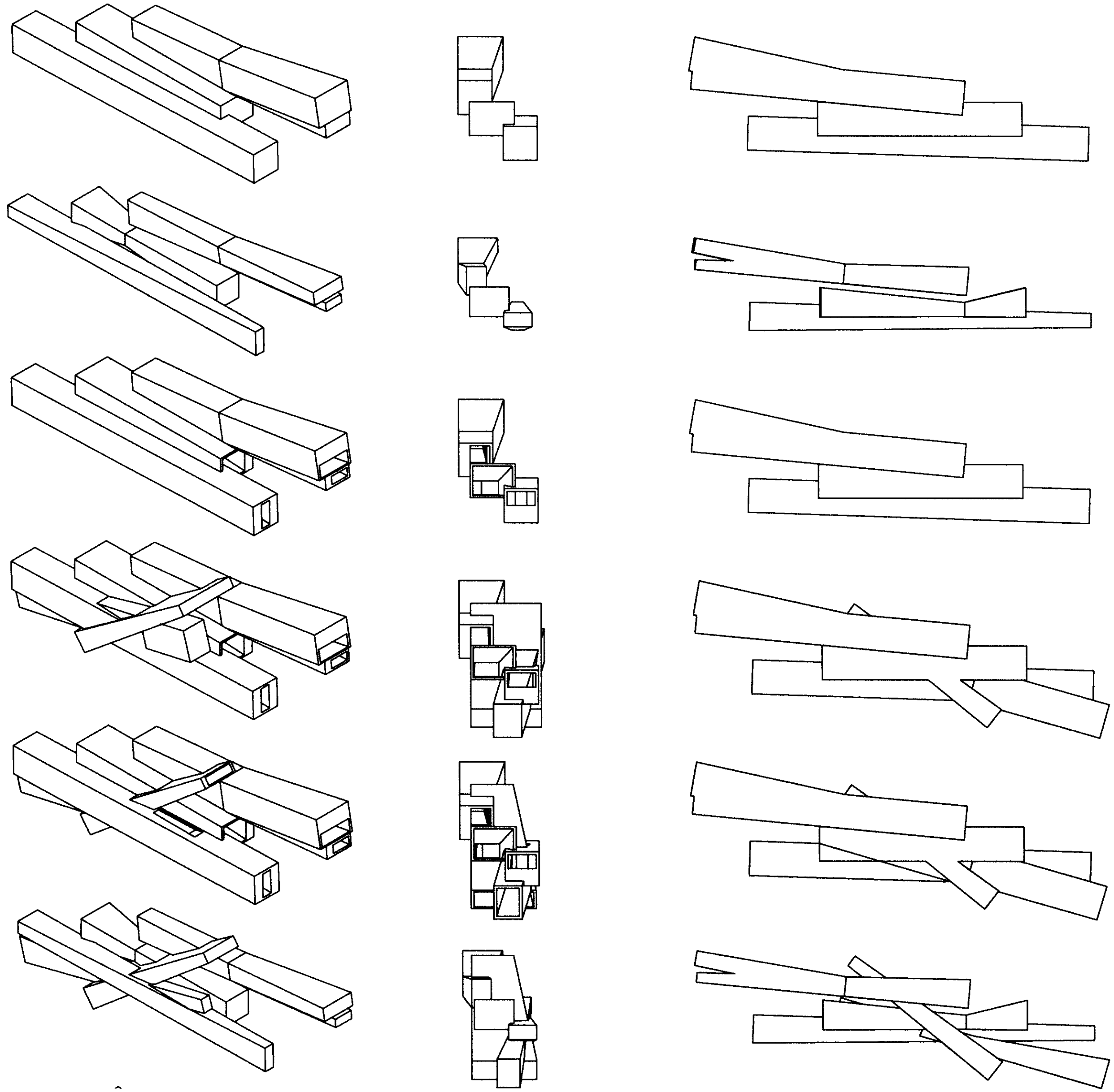
SPATIAL DIAGRAMS

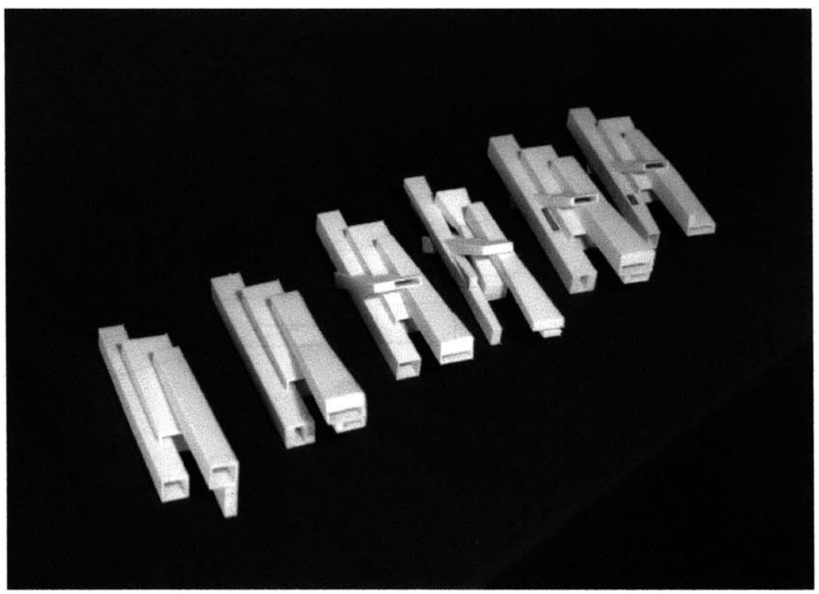


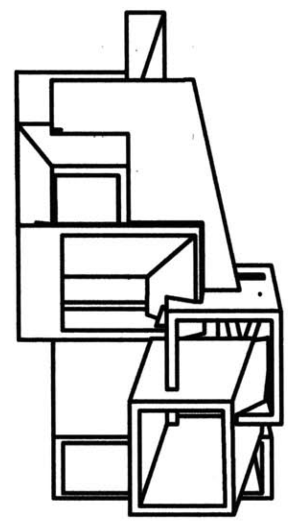
Kenmore square is an intense place with a large number of people, automobiles and buses navigating within and through Kenmore Square on a daily basis. The major circulation routes largely exist at the perimeter of the intersection, with the center left, for the most part, as lost or dead space. The center is left as an isolated and vacant public space with little or no function or activity taking place. Public spaces facilitate social interactions within planned and constructed spaces while providing for the diverse elements found within an urban environment. The thesis investigates the potential activation of this area within Kenmore Square. At the architectural scale, a buildings form can facilitate social interactions both visually, and physically.

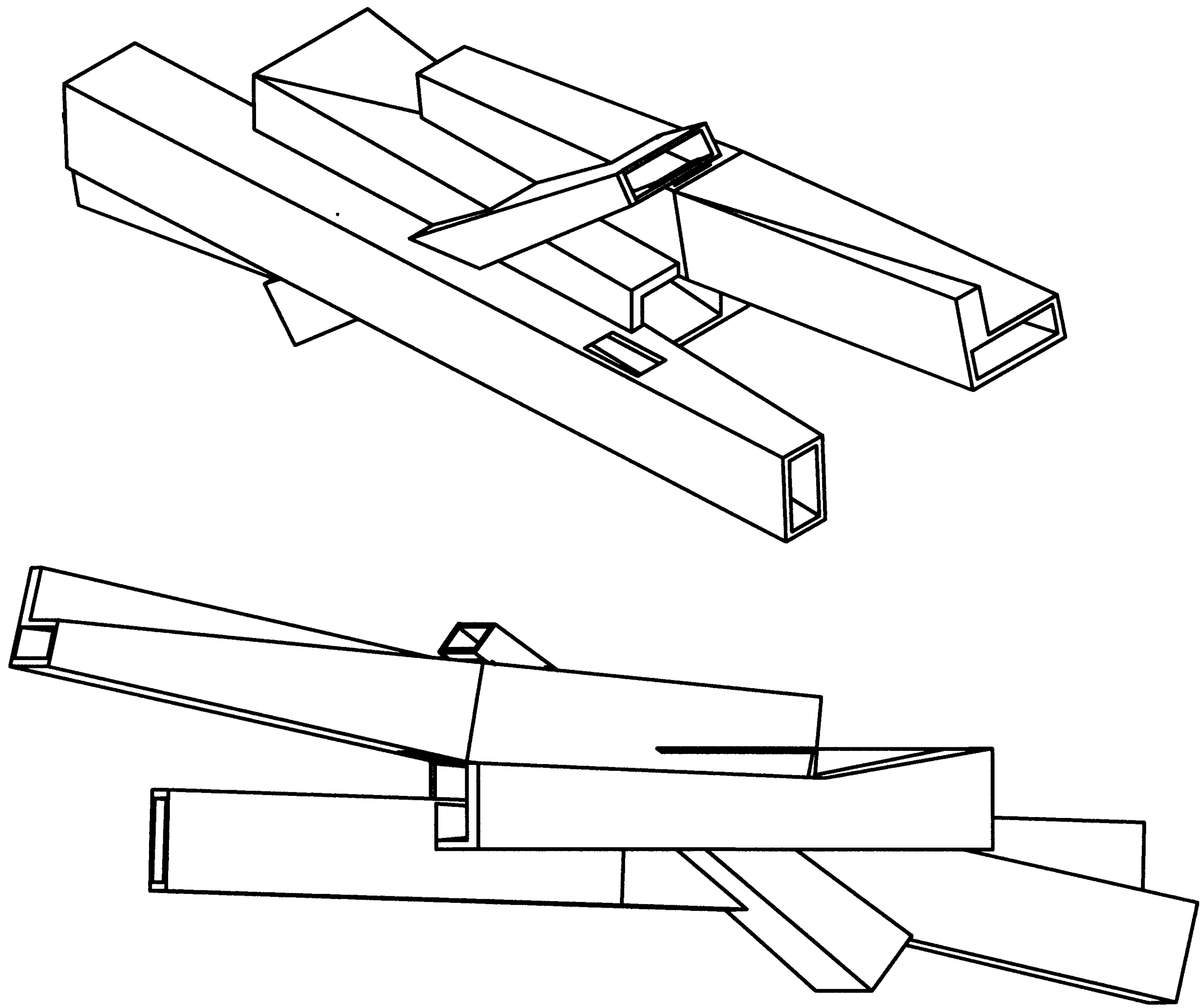
Beginning with this concept, three volumes were intersected at points below, on and above the horizon plane. Specific programmatic conditions developed through the analysis of the pinhole camera devices, were assigned to each of the three volumes. The volumes length was determined by three focal distance lengths, long, medium and short. The orientation of each volume and its position responds to the uncertainties of the site. Each volume is subtracted from each other resulting in voids. The intersection of these voids generates multiple perspectives. Two additional volumes were added to increase the perspectival space.

The architectural form is a device generated by the uncertainties represented in the pinhole images. The Device occupies Kenmore square redefining the urban identity of the place. The potential exists for the device to be integrated with number of undefined programmatic functions. The movement of body as it crosses through the multiple, overlapping, perspectives generates a connection between the body and the urban landscape. The perception of the urban landscape is defined by the spatial experience of the architectural form.

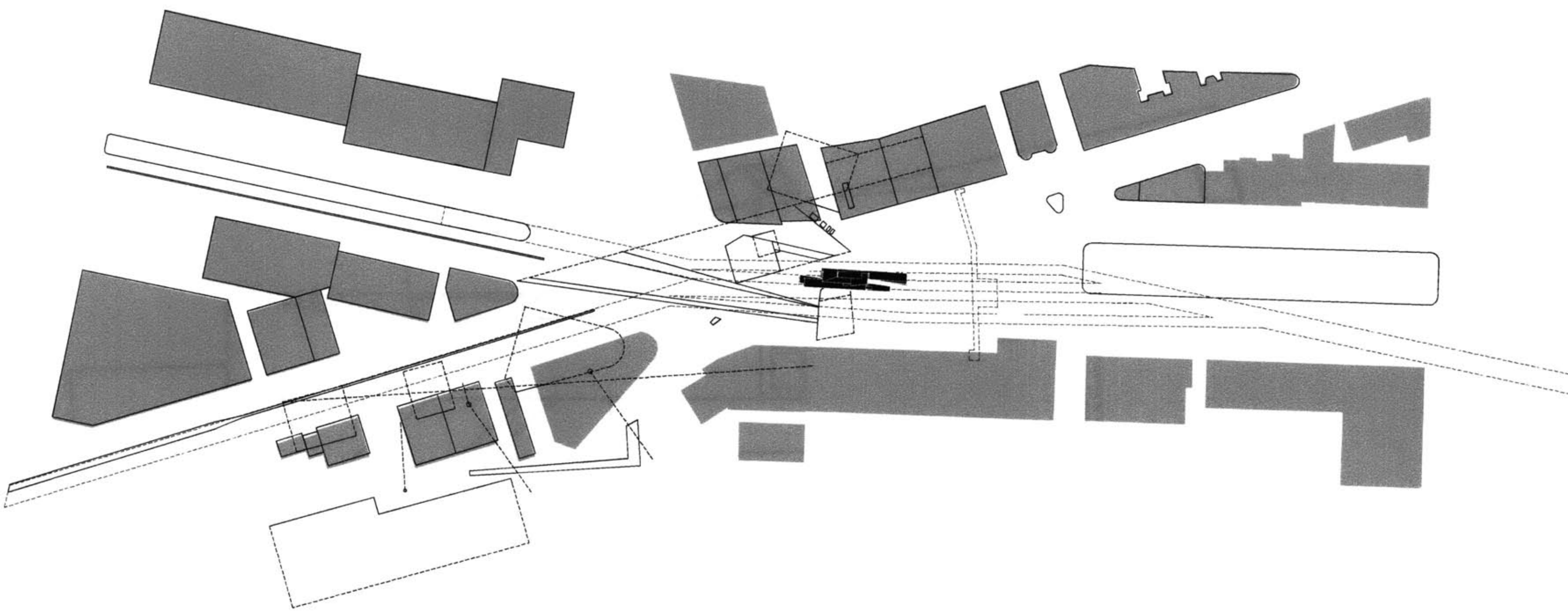


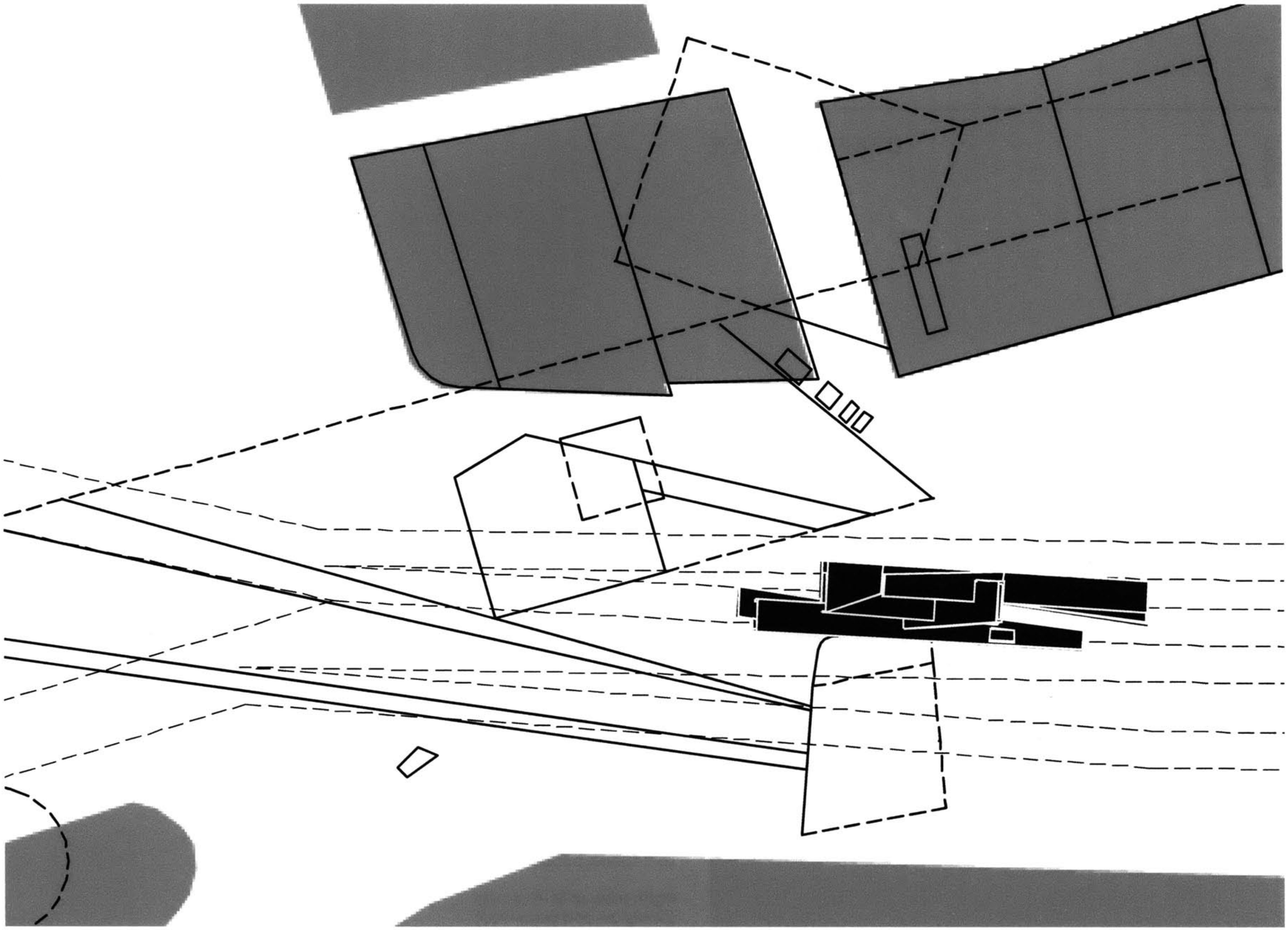






SITE DIAGRAM

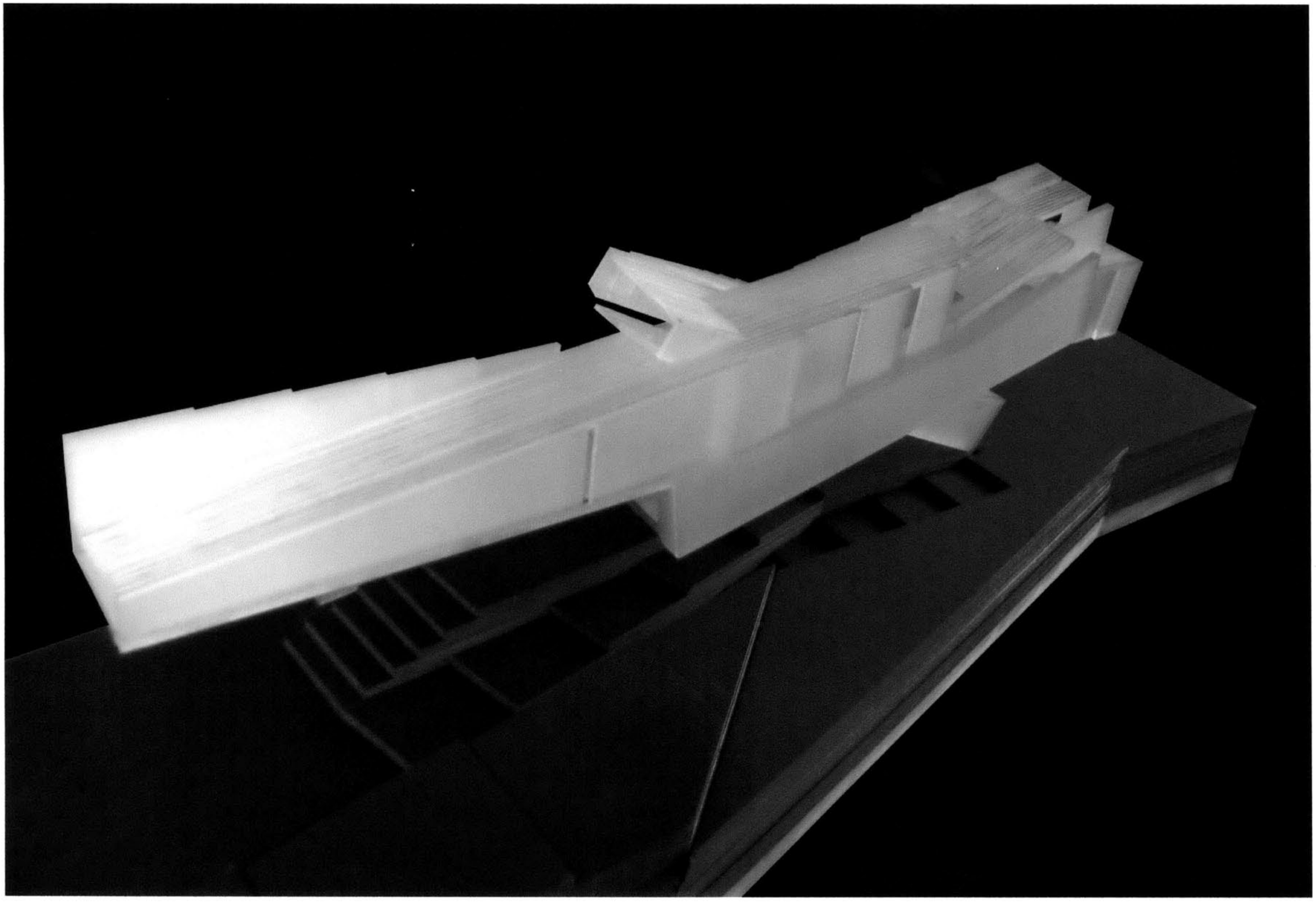


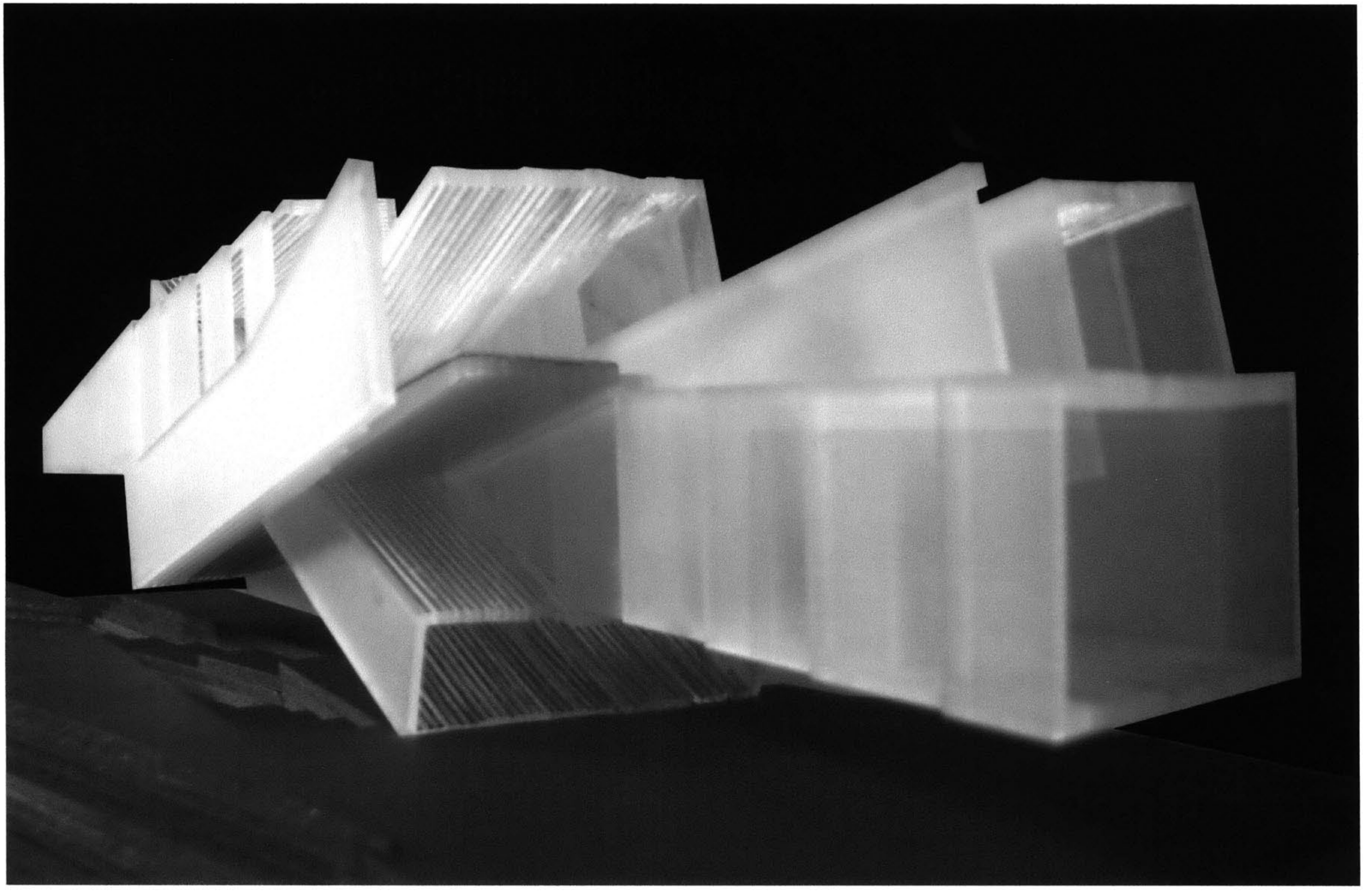


URBAN DEVICE

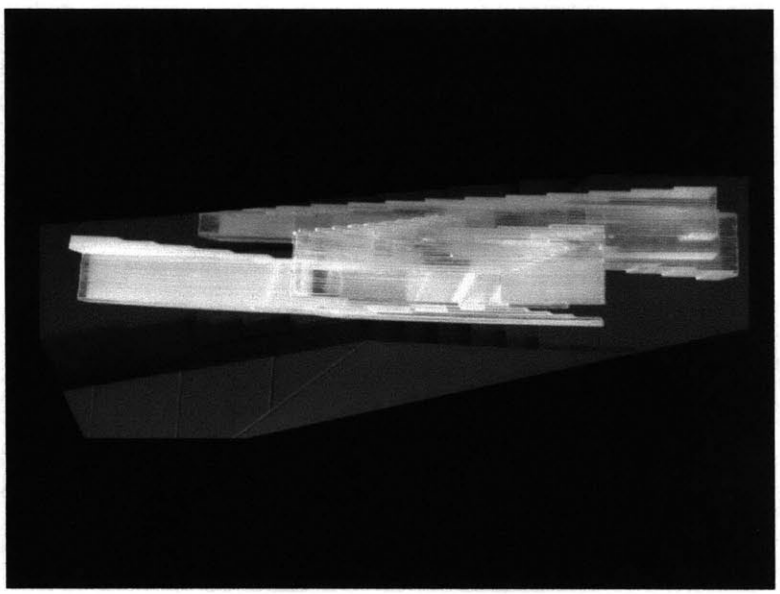
Left: Interior perspective of model

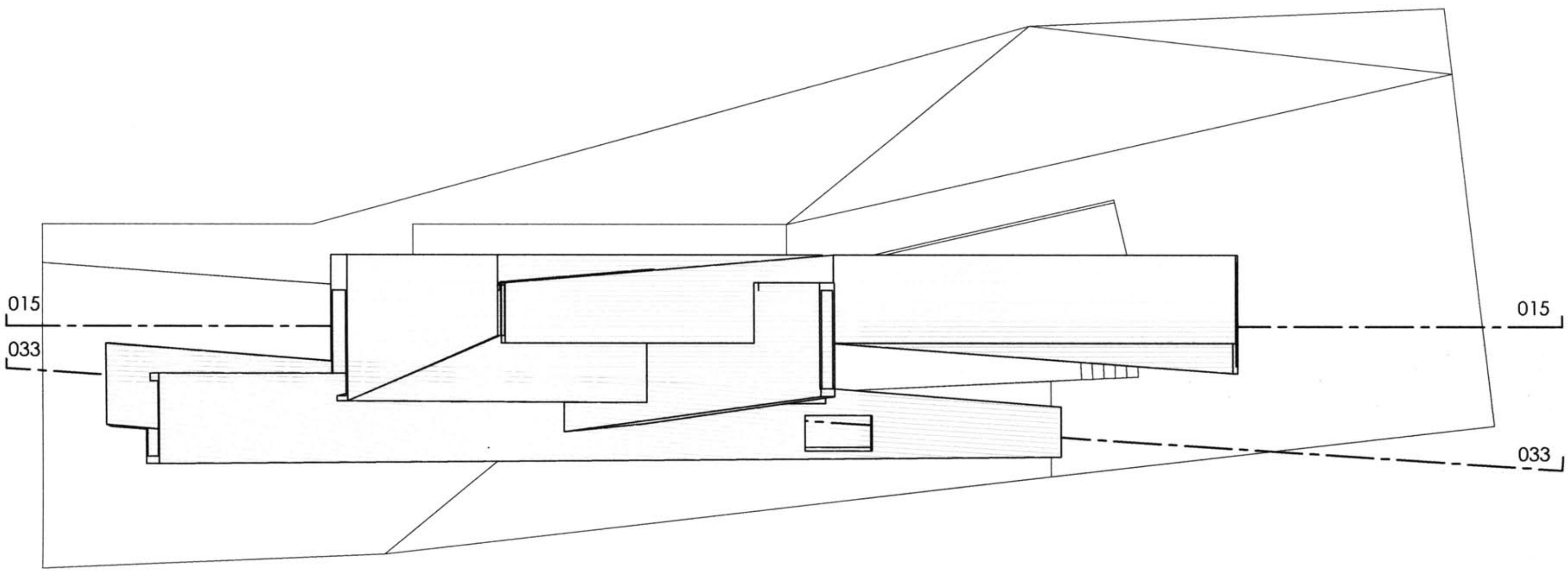
Right: View of 3/16" model
(plexiglass and basswood)





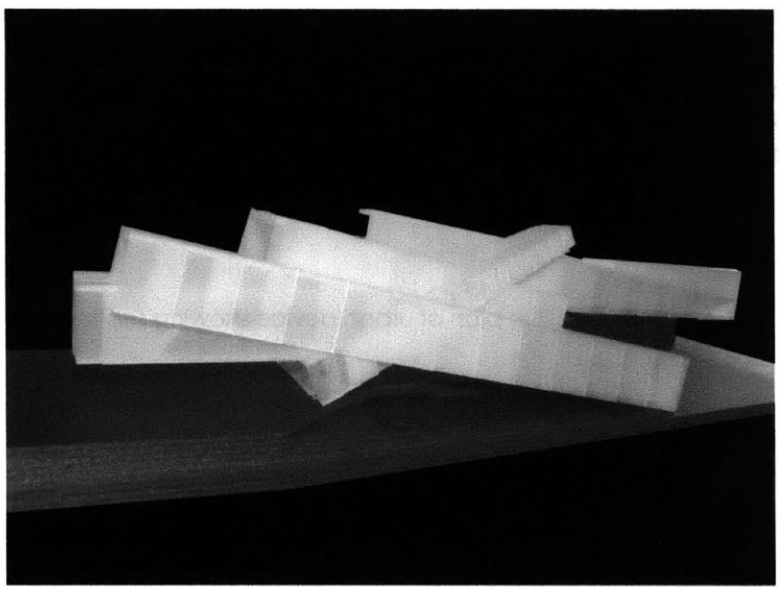
DEVICE PLAN

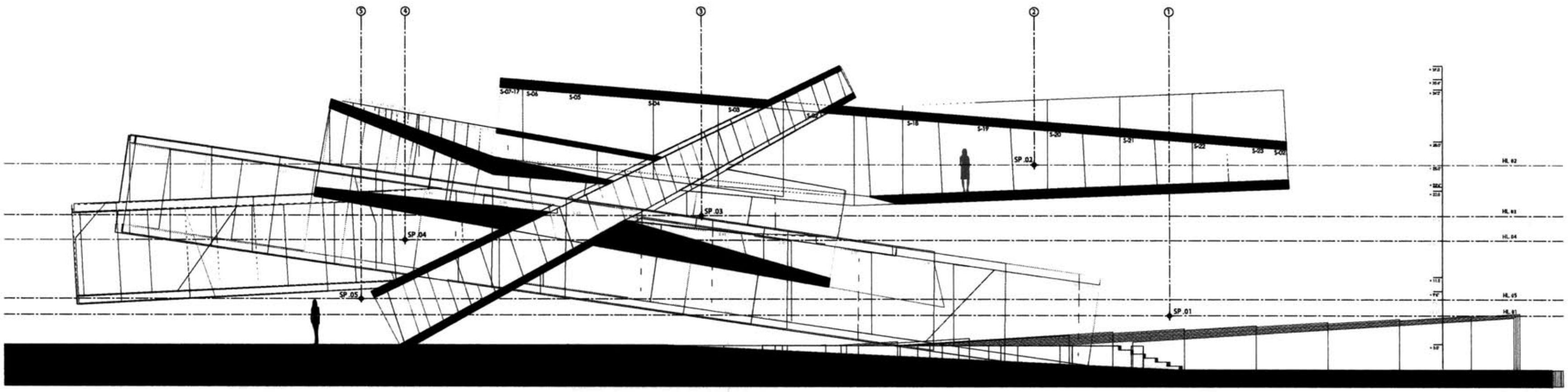




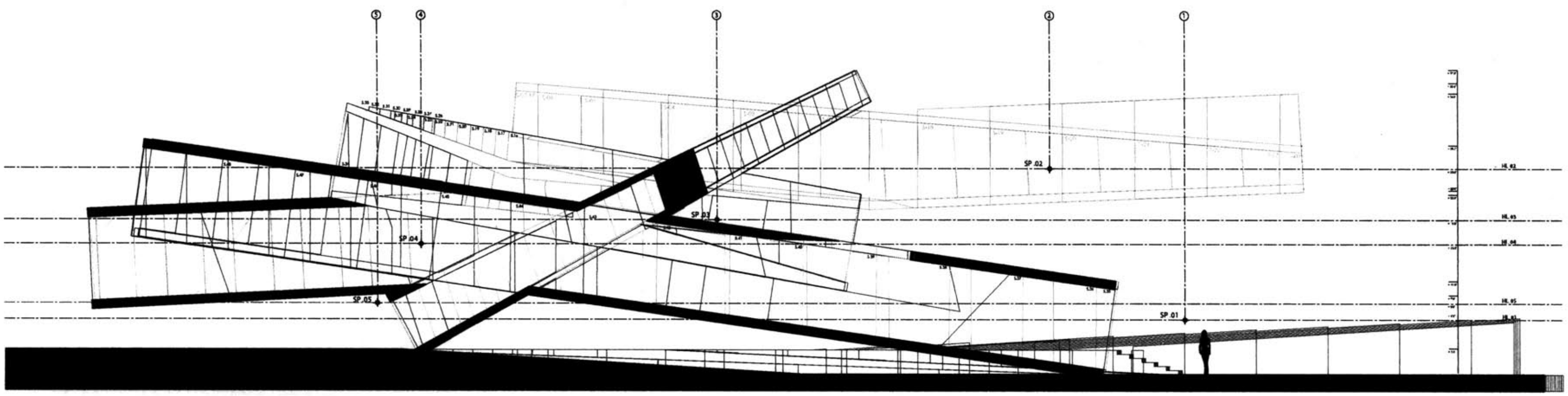
Site plan of urban device showing section cuts

SECTION DIAGRAMS



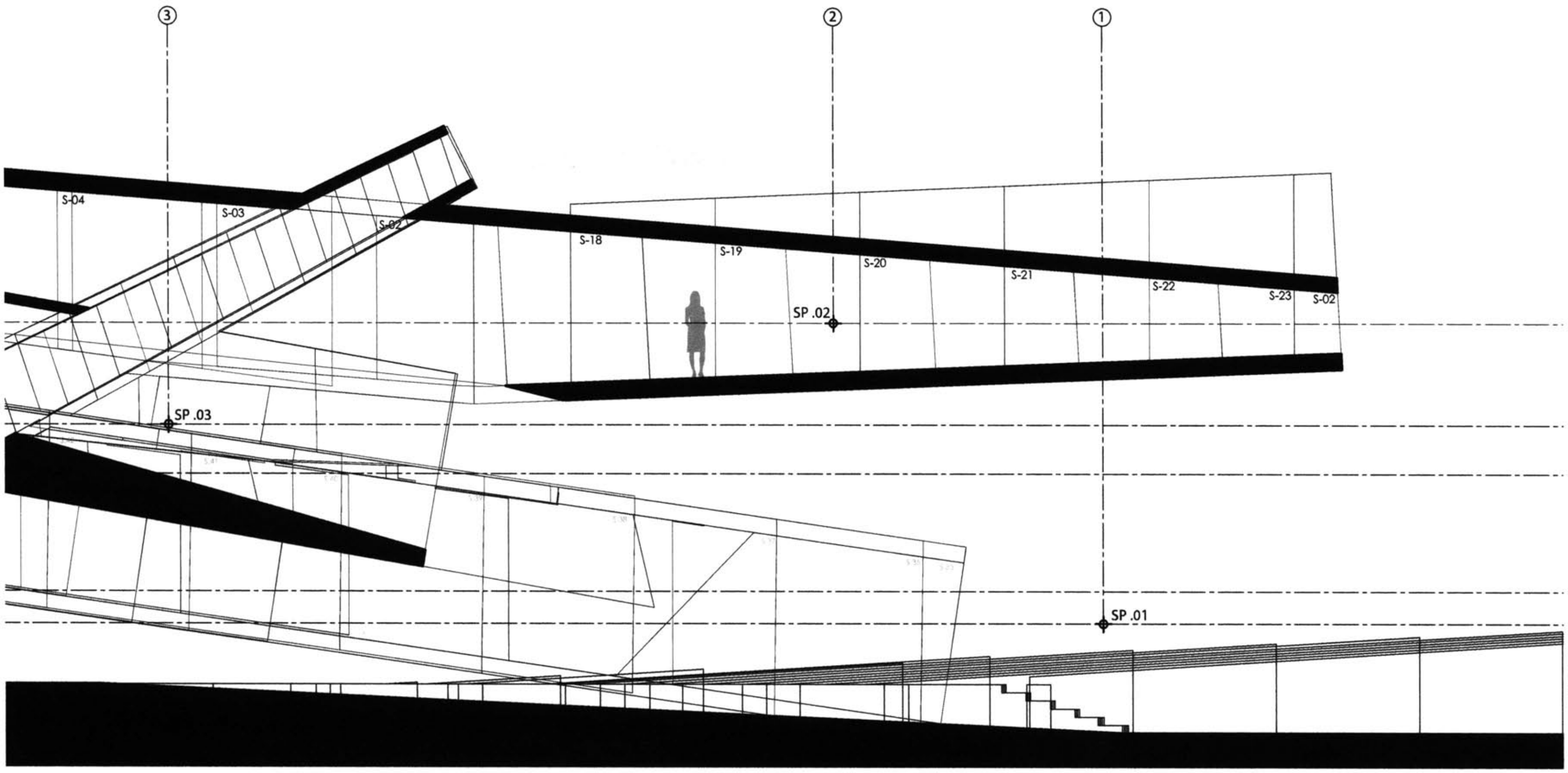


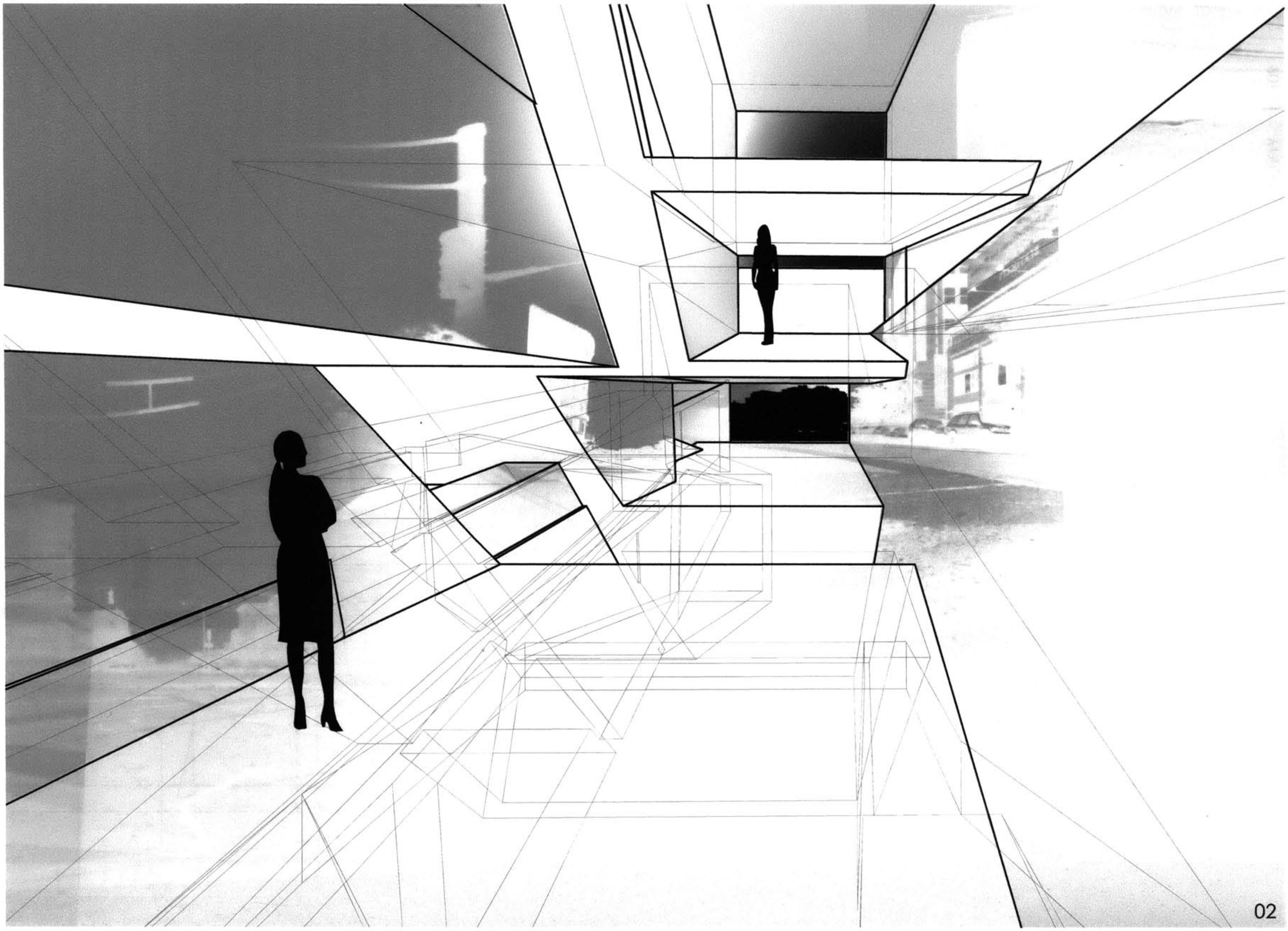
Section 015

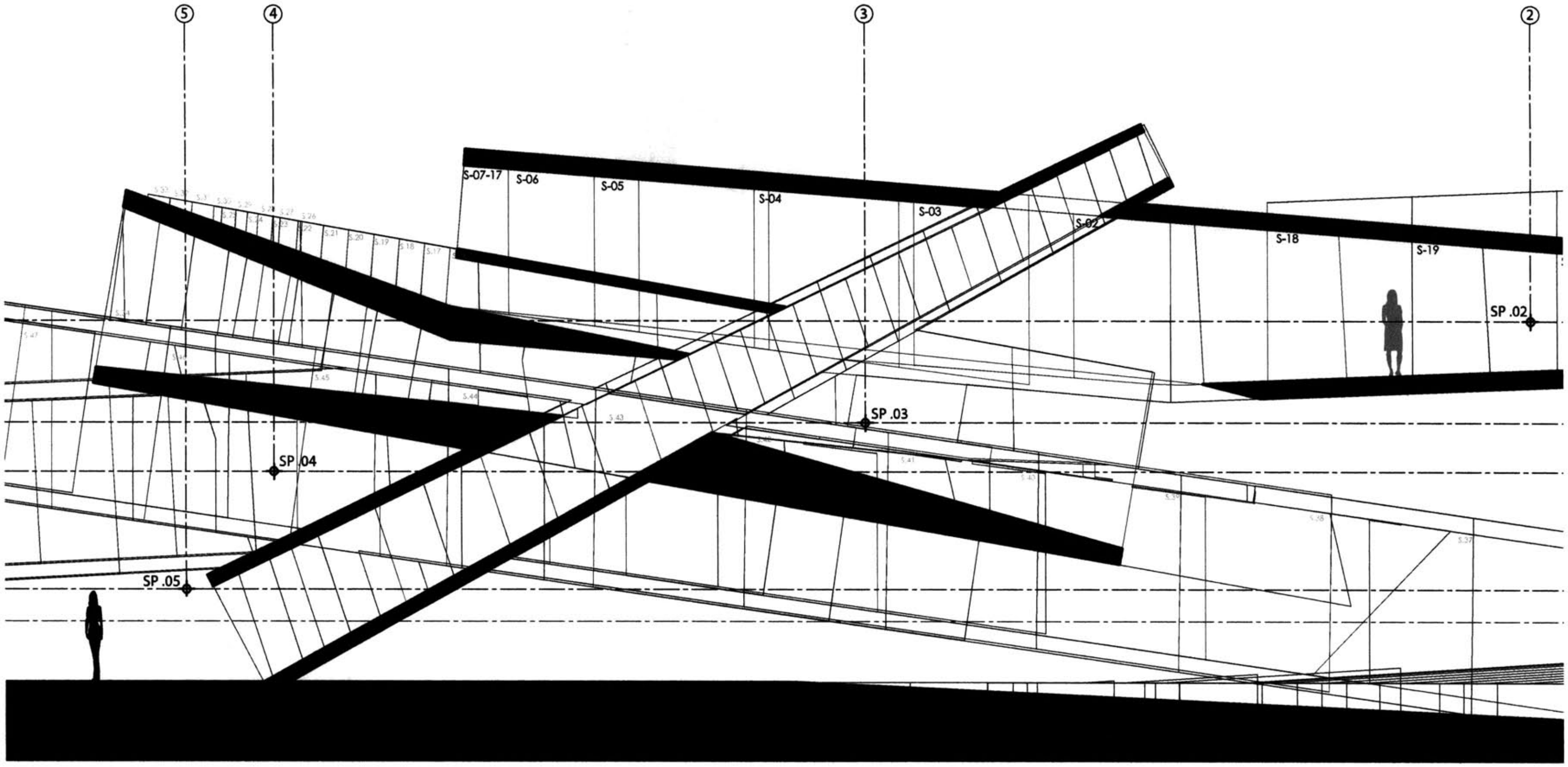


Section 033

PERSPECTIVES






5
4
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2
S-07-17
S-06
S-05
S-04
S-03
S-02
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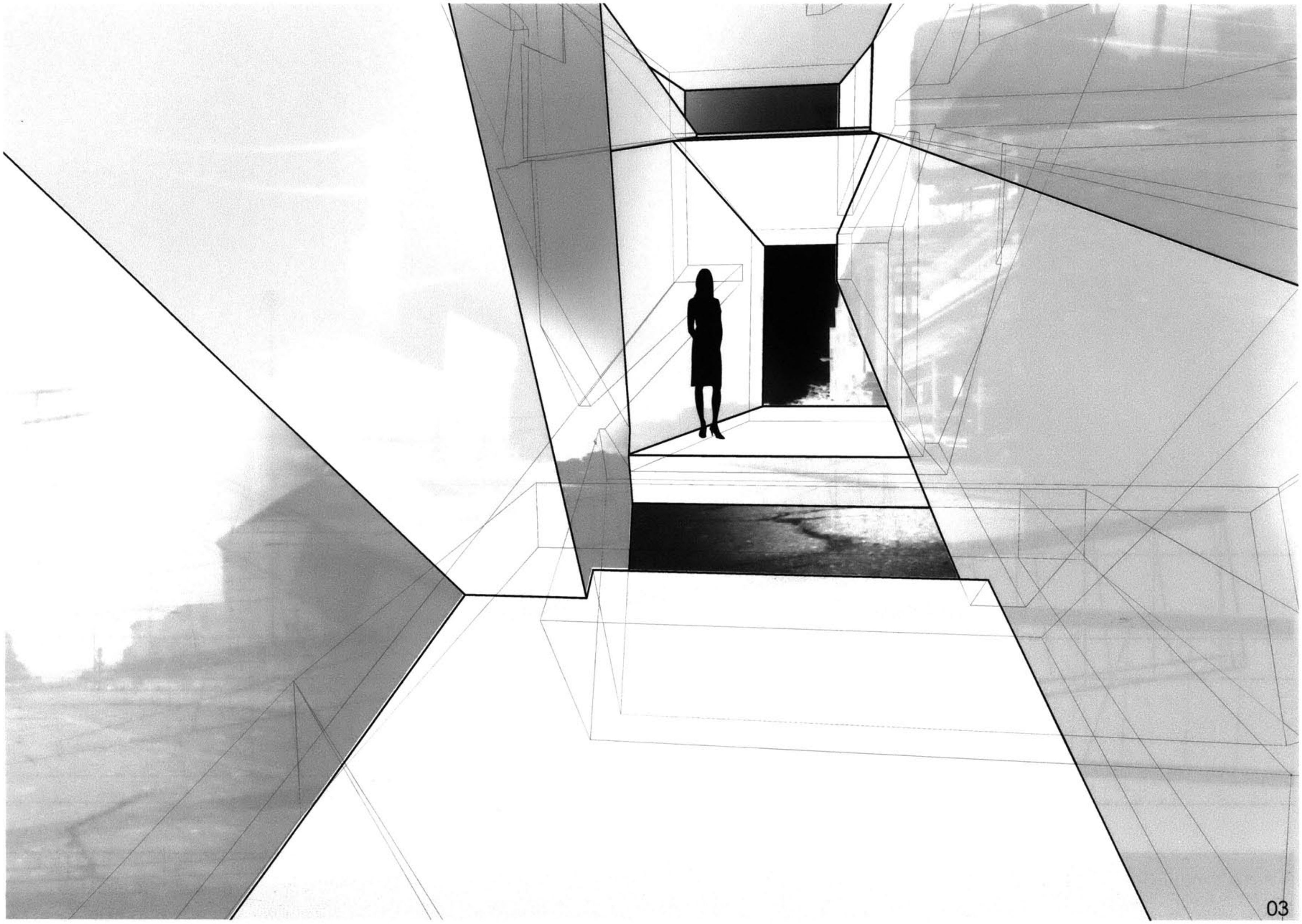

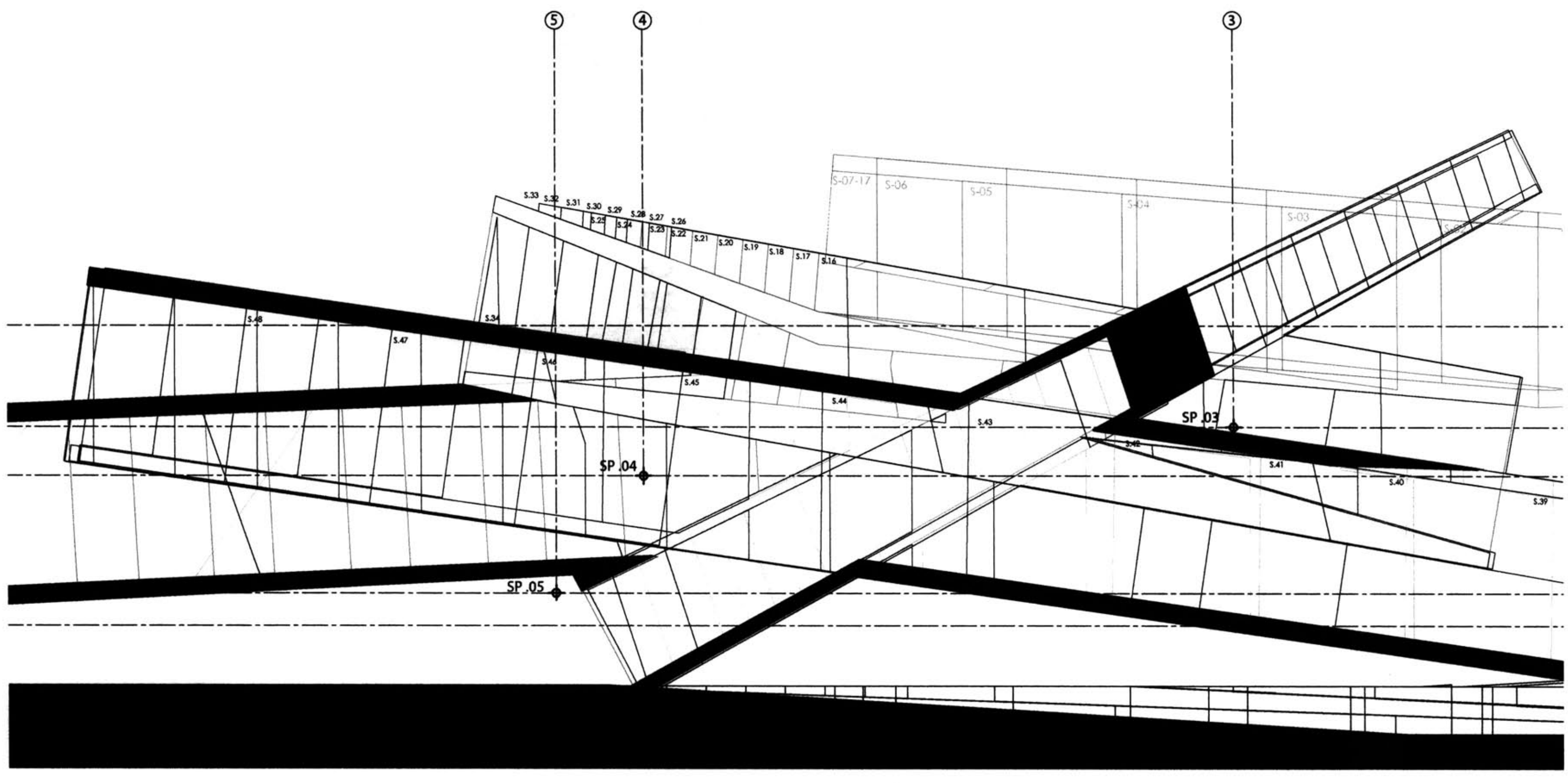

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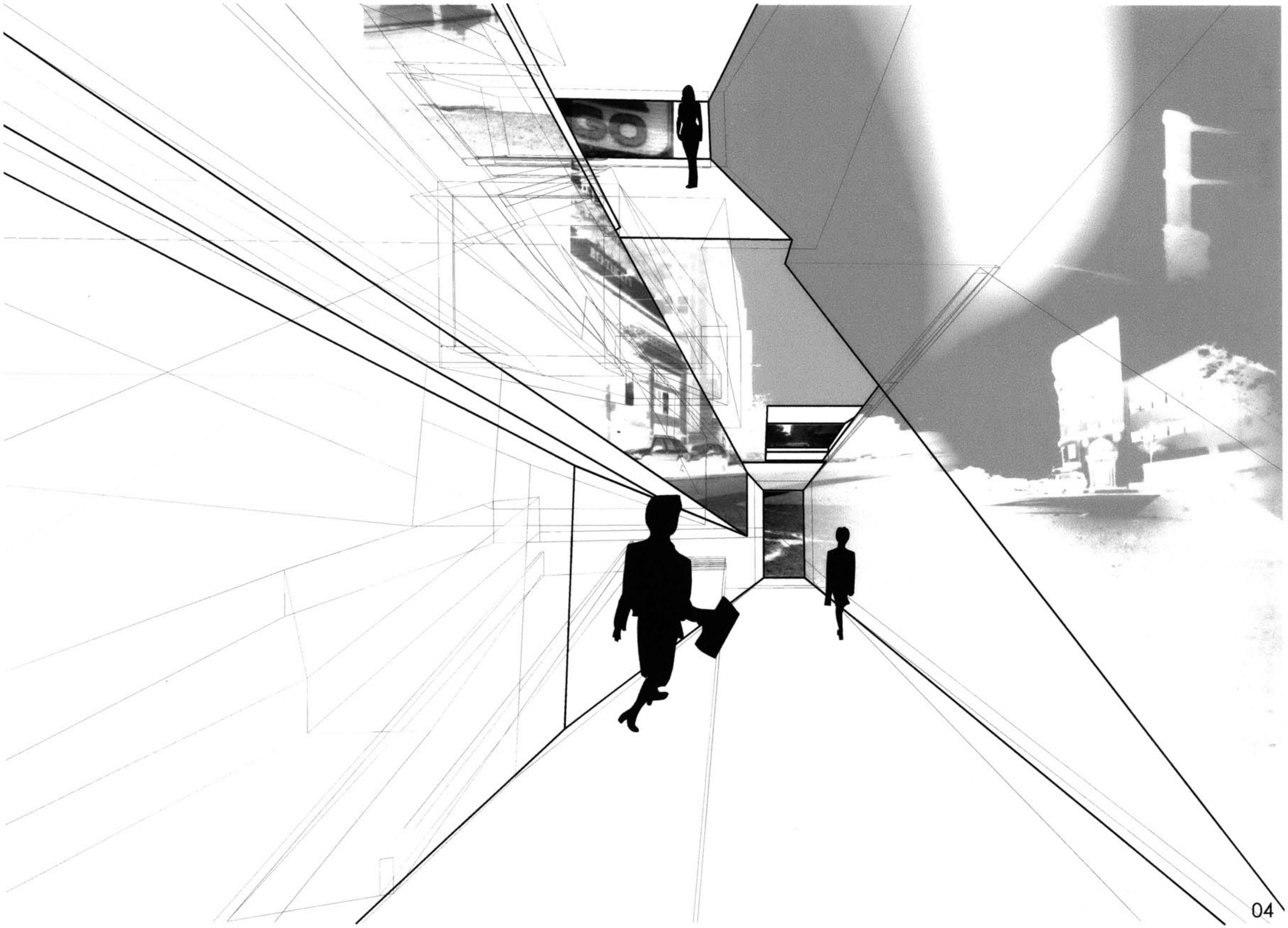
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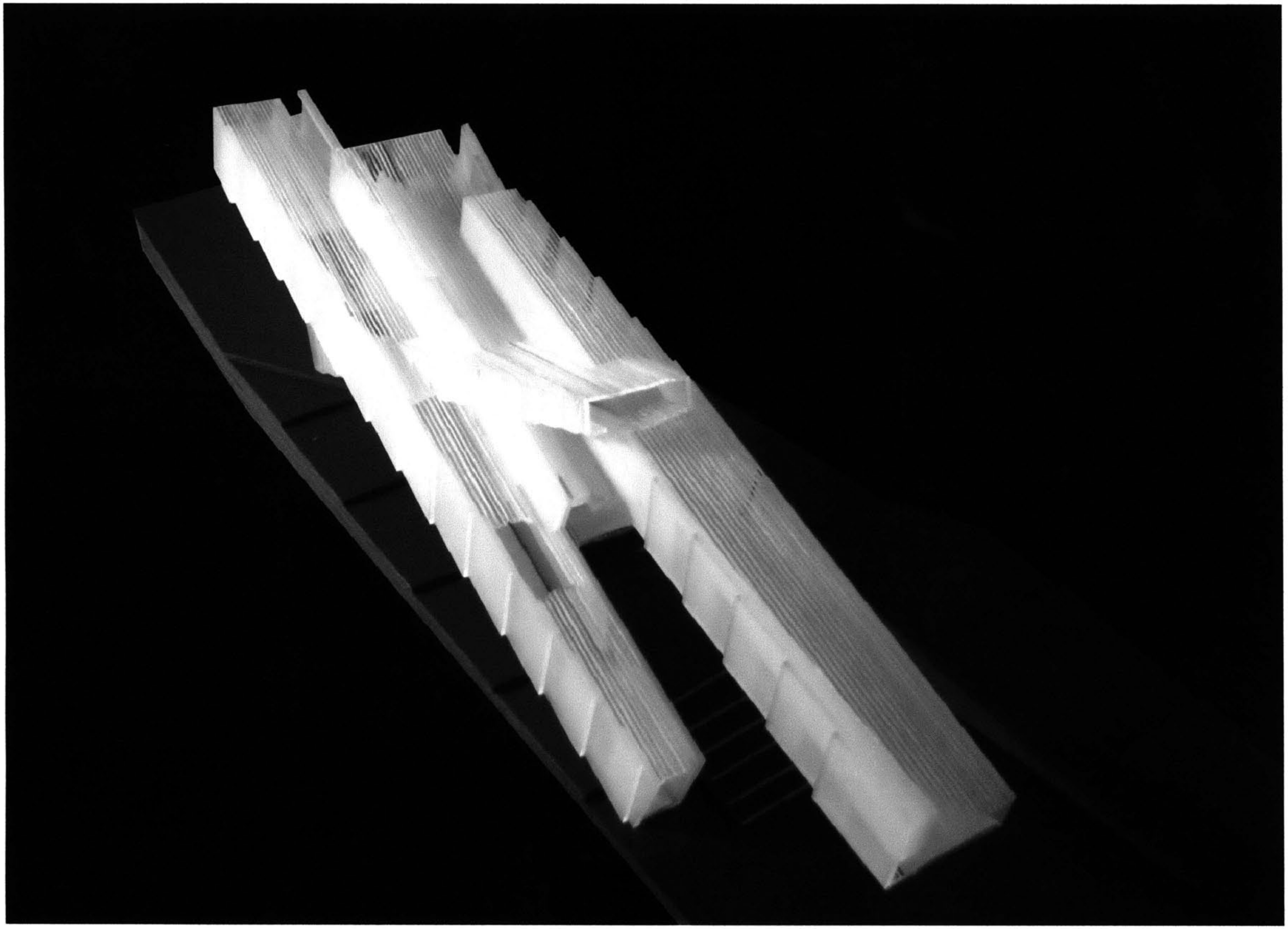

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NOTES FROM TEXT

1. Iain Borden; "Body Architecture: Skateboarding and the Creation of Super-Architectural Space," in Hill (ed.), *Occupying Architecture*, pp. 201
2. Henry Lefebvre, *The Production of Space*, (Oxford: Blackwell, 1991) pp 169
3. Lefebvre, *The Production of Space*; pp 169
4. Kelvin Ho, "Skateboarding: an Interpretation of Space in the Olympic City," pp.99
5. C.R. Stecyk II, "Aspects of the Downhill Slid" in C.R. Stecyk III, Glen E. Friedman, *Dogtown – The Legend of the Z-Boys* (Burning Flags Press, 2000) p.1
6. Borden, "Another Pavement, Another Beach," The Unknown City, pp 180.
7. Borden, *Skateboarding, Space and the City, Architecture and the Body* (New York: Berg, 2001) pp. 31
8. Kelvin Ho, "Skateboarding: an Interpretation of Space in the Olympic City," pp. 99
9. Kelvin Ho, "Skateboarding: an Interpretation of Space in the Olympic City," pp 102
10. Eric Renner, *Pinhole Photography, Rediscovering a Historic Technique*, Third Edition (New York: Focal Press, 2004) p. 36
11. Eric Renner, *Pinhole Photography*, p. 43
12. Eric Renner, *Pinhole Photography*, p.41
13. Eric Renner, *Pinhole Photography*, p 42
14. Eric Renner, *Pinhole Photography*, p 33, 34
15. Eric Renner, *Pinhole Photography*, p 44
16. Eric Renner, *Pinhole Photography*, p 54
17. Eric Renner, *Pinhole Photography*, p 161
18. James Corner, "The Agency of mapping: Speculation, Critique and Invention." in *Mappings*. Denis Cosgrove (ed.) (Reaktion, London. 1999) p. 235
19. James Corner, p.235
20. Bernard Tschumi' *The Manhattan Transcripts* (London: Academy Editions), 1994 pp. 7
21. Clare Robinson, "Browsing, Bouncing, Murdering, and Mooring; Negotiating the Relationship between Inhabitation and Representation" in Journal of Architectural Education, November 2005 pp. 29
22. James Corner, p1
23. Clare Robinson, p.27, Borden, *Skateboarding, Space and the City*, p. 92-96
24. Clare Robinson, p.27

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1. Photography Installation at Massachusetts Institute of Technology. Courtesy of Author, May 2005
2. Eric Renner, *Pinhole Photography, Rediscovering a Historic Technique*, Third Edition (New York: Focal Press, 2004) p. xi
3. Eric Renner, *Pinhole Photography*, p. 16
4. Ray Barbee, Nosegrind, San Francisco, 1996. Photograph by Tobin Yelland from "Transworld Skateboarding", (June 2005) p.139
5. Mickey Reyes, Wallride, San Francisco, 1987. Photograph by Tobin Yelland from "Transworld Skateboarding", (June 2005) p.141
6. C.R. Stecyk III, Glen E. Friedman, Dogtown – The Legend of the Z-Boys (Burning Flags Press, 2000) p.75

7-9. Eric Renner, *Pinhole Photography*, p. 43, from various manuscripts by Leonardo da Vinci (1452 – 1519)

10. Eric Renner, *Pinhole Photography*, p. 42, from Brook Taylor, New Principles of Linear Perspective, 1811

11-14. Eric Renner, *Pinhole Photography*, p. 39, from Robert Rosinsky, How to Convert an Ordinary Room into a Camera obscura, 1987

15-17. Eric Renner, *Pinhole Photography*, p. 45, from Albrecht Durer, Book of Measurements, circa 1525

18. Pinhole, Paint Can Camera, Image courtesy of Author

19-21. Pinhole Photographs from Paint Can camera, mages courtesy of author, October 2005

22. Eric Renner, *Pinhole Photography*, p. 162, from Robert Mikrut and Kenneth A. Connors, Pinhole Calculations from 10 to 1000mm Focal Lengths
23. Bernard Tschumi' *Architecture and Disjunction* (New York and Cambridge: The MIT Press) 1996, p172
24. MT 4 The Block , from Bernard Tschumi' *The Manhattan Transcripts* (London: Academy Editions, 1994) p. 49
25. Pinhole Image Reconstruction, Image courtesy of Author
26. Analytic drawing fro Suitcase studies, from Elizabeth Diller and Ricardo Scofidio, "Suitcase Studies: The Production of a National Past", in *Back to the Front: Tourisms of War* (F.R.A.C. Basse – Normandie, 1994) p. 53
27. Corridor Installation. Massachusetts Institute of Technology, September 2004, Image courtesy of Author

BIBLIOGRAPHY

Books

Iain Borden, Joe Kerr, Alicia Pivaro and Jane Rendell (eds), *Strangely Familiar: Narratives of Architecture in the City* (London: Routledge 1996)

Iain Borden, *Skateboarding, Space and the City; Architecture and the Body* (New York: Berg, 2001)

Iain Borden, Joe Kerr, Jane Rendell with Alicia Pivaro (eds), *The Unknown City: Contesting Architecture and Social Space* (Cambridge, Mass: MIT Press, 2001)

Michel de Certeau, *The Practice of Everyday Life*, translated by Steven Rendall (University of California Press, Berkeley, 1984)

James Corner, "The Agency of mapping: Speculation, Critique and Invention." in *Mappings*. Denis Cosgrove (ed.) (Reaktion, London. 1999)

Elizabeth Diller and Ricardo Scofidio, "Suitcase Studies: The Production of a National Past", in *Back to the Front: Tourisms of War* (F.R.A.C. Basse – Normandie, 1994)

Jonathan Hill (ed.), *Occupying Architecture: Between Architecture and the User* (London: Routledge, 1998)

Sanford Kwinter, *Architectures of Time; Toward a Theory of the Event in Modernist Culture* (Cambridge, Mass: MIT, 2001)

Peter Lang, William Menking, *SuperStudio, Life Without Objects* (Skira Editore S.p.A. distributed by Rizzoli International Publications, Inc. 2003)

Henri Lefebvre, *The Production of Space* (Oxford: Blackwell, 1991)

Henri Lefebvre, *Writings on Cities* (Oxford: Blackwell, 1996) eds. Eleonore Kofman and Elizabeth Lebas

Tom McDonough (ed), *Guy Debord and the Situationist International*, (MIT Press, 2002)

Books (cont.)

Eric Renner, *Pinhole Photography, Rediscovering a Historic Technique*, Third Edition (New York: Focal Press, 2004)

Paul Rodaway, *Sensuous Geographies: Body, Sense and Place* (London: Routledge, 1994)

C.R. Stecyk III, Glen E. Friedman, *Dogtown – The Legend of the Z-Boys* (Burning Flags Press, 2000)

Bernard Tschumi' *Architecture and Disjunction* (New York and Cambridge: The MIT Press) 1996

Bernard Tschumi' *The Manhattan Transcripts* (London: Academy Editions, 1994)

Carherine de Zegher and Mark Wigley (eds), *The Activist Drawing, Retracing Situationist Architectures from Constant's New Babylon to Beyond* (MIT Press, 2001)

Articles

Iain Borden, "Another Pavement, Another Beach: Skateboarding and the Performative Critique of Architecture", in Borden, Kerr, Rendell with Pivaro (eds), The Unknown City

Iain Borden, "Beneath the Pavement, the Beach: Skateboarding, Architecture and the Urban Realm", in Borden, Kerr, Pivaro and Rendell (eds), Strangely Familiar, pp. 82-6

Articles (cont.)

Iain Borden, "Body Architecture: Skateboarding and the Creation of Super-Architectural Space", in Hill (ed.), Occupying Architecture, pp.195-216

Eric Fredericksen, "Architecture that Shreds", Architecture (April 2002)

Kelvin Ho, "Skateboarding: an Interpretation of Space in the Olympic City", in Architectural History and Theory; (1999)

Clare Robinson, "Browsing, Bouncing, Murdering, and Mooring; Negotiating the Relationship between Inhabitation and Representation" in Journal of Architectural Education, November 2005 pp. 27-33

Marc Spiegler, "The New Modern Lovers" Metropolis, (Sept 1994) pp.14,19

Internet Sites

"The Physics of the Ollie" in Skateboarding Directory, News
http://www.SkateboardDirectory.com/articles/478516_the_physics_of_the_ollie.html,
(posted 10/27/2001) accessed January 2005

Iain Borden, "A Performative Critique of the American City: the Urban Practice of Skateboarding, 1958-1998"
in Skateboarding Directory, News
http://skateboarddirectory.com/articles/263054_a_performative_critique_of.html
(posted 5/19/2001) accessed January 2005

Booby Young, A Skateboarder's guide to Architecture or an Architect's Guide to Skateboarding,
(Volume 3, Issue 4; Loud Paper Magazine)
http://www.loudpapermag.com/article.php?id=2

http://www.pinholeresource.com/