TOP GIRLS:
CONVENTIONAL COSTUMES AND A DIGITIZED STAGE DESIGN

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Abstract

Top Girls: Conventional Costumes and a Digitized Stage Design describes the process of designing the projected sets and traditional costumes for an intermedial production of Caryl Churchill's Top Girls. Intermediality in performance refers to a blending or fusion of differing media in a production. What this practical thesis intends to do is explore the possibility of marrying some of the new techniques of video projection mapping with the requirements of theatrical scenic and prop design, using a limited budget. The intent of this thesis is to demonstrate that a basic mapping overlay of set and props images over simple surfaces is easily attainable.

Dedication

This work is dedicated to my Introduction to Theatre Technology students at the University of Waterloo, 2011-12 and 2012-13, who allowed me to make every one of my successes and many more failures in the realization of this work — teaching moments. May you learn from my mistakes — and more to the point — not worry about making your own.

Acknowledgements

The author would like to acknowledge the support of the entire University of Waterloo

Drama Department for allowing me to try something new in the mainstage season —

specifically the support of Sharon Secord, Bill Chesney, and Tallen Kay.

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Chapter 1

Introduction: A Realized Theatrical Production

This thesis will document the research and process completed towards a realized

set and costume design for Caryl Churchill's <u>Top Girls</u> that was presented during the

regular season of mainstage productions for the Drama Department at the University of

Waterloo, in Waterloo, Ontario in March 2013. Theatre productions at Waterloo are

wholly student built and operated. University faculty, staff, or other outside professionals

supervise the creation and integration of all technical aspects of a theatrical production

(the sets, costumes, props, lighting, sound, video, and publicity). Students are

occasionally allowed to design, but they certainly fulfill all of the rest of the roles from

the operation of the lights, sound, and video to calling of the cues as stage managers.

High standards and ownership of responsibilities are expected, but as it is a school,

mistakes can and do happen. A school is a place where mistakes can happen without fear

of reprisals — unless for a grievous disregard for safety. Student crew members can still

be replaced for incompetence, but the training received should allow any student the

opportunity to learn almost arcane skills along with the ability to troubleshoot associated

issues.

The use of projections in live theatrical performance is not new, especially when

used to establish settings or location in a similar manner to how costume, sound, or

lighting function in theatrical design. 3D projection mapping is currently used by many

corporations as an advertising tool on building exteriors. It is the projecting of images

that "map" on to the physical dimensions of the building. What this practical design

thesis intends to do is marry the relatively new technique of video projection mapping with the requirements of theatrical scenic and prop design.

The first section of Chapter 1 looks at some of the critical response from over the last 30 years to <u>Top Girls</u>. The next section discusses the historical use of projections in theatrical performances and illustrates how they have been used over the past 250 years. This is followed by a chapter on the set design research for this production of <u>Top Girls</u>, and why the choice to use projections was made. The math and drawings pertaining to the placement of the projectors in the theatre — and the subsequent challenges — are contained in the following sections. The third chapter describes the costume design research for each of the characters and gives a general idea for costume choices.

Seven appendices follow; the first is a standard production technical analysis of the Samuel French actor's edition of <u>Top Girls</u>, the second contains my set renderings, the third includes my designs for projection drafts, the forth contains my costume renderings, the fifth is a costume tracking plot, the sixth contains some process documentation, and finally the seventh holds production stills.

<u>Top Girls</u>: Historical Context

<u>Top Girls</u>, by Caryl Churchill, first published and presented in 1982, is a contemporary play that takes place during Margaret Thatcher's first term as Prime Minister of the United Kingdom. The play tells the story of Marlene, a newly minted executive at the Top Girls Employment Agency, and the difficulties she has overcome to get that far. Much of the critical response to <u>Top Girls</u> deals with feminism and the issues and struggles

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faced by Marlene, her sister Joyce, and the five historical women characters who appear in the opening act. I believe that because Caryl Churchill refers to herself as a feminist writer (Aston 1997, 18) and that because the play has a totally female cast, many critics refer to it as a feminist play — yet I would beg to differ. To me, Top Girls is a play about class — the "one percent" in the current vernacular — and the struggles that the "99%", in their fight for fairness, must deal with before equality can be attained. Aston claims that Churchill was "increasingly concerned about the dangers of bourgeois feminism..." (Aston 1997, 38). The feminism that seemed to appear in America in the early 1980's — the capitalist version which also appeared to be Thatcher's version — was going in a different direction to the socialist vision which Churchill espoused. In An Introduction to Feminism and Theatre, Aston comments on the oppressive Superwoman and the expense that Marlene had to pay to get to that Superwoman position; the oppression of her sister Joyce and the treatment of "their" daughter, Angie (1995, 76). Helene Keyssar, in her book Feminist Theatre, suggests that Top Girls hardly creates positive inspiration for the feminist cause and that the audience leaves the theatre with a sense of despair (1984, 98). In a 1984 interview with American playwright Emily Mann, Churchill said that Top Girls was to "first look as though it was celebrating the achievements of women and then ... ask, what kind of achievement is that?" (Betsko and Koenig 1987, 82).

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A Brief History of Projections in Theatrical Performances

It is possible to claim that the first instances of the use of projections in theatrical performance were the use of shadows on cave walls to help tell the story of the hunt, but the intent of this writing is to examine the historical use of projection technology in theatrical performance. I will not discuss the long and varied traditions of shadow puppetry found throughout China, South Asia, and Turkey. Projections, although not necessarily for theatrical performances, had been referred to by Aristotle in Problems, c. 330 B.C.E., when discussing the creation of a camera obscura (Trigg 2006), and by early Chinese writers in the fifth century C.E.. They were even written about as early as the second century C.E., with references to "magic mirrors" that would project a landscape or other images from a small bronze and glass disk onto a wall (Maryon 1963). George Auckland and Mervyn Heard write in The Magic Lantern Society's website that, "[a]bout 1420, [t]he earliest reference I can find to anything like a projection lantern is from Liber Instrumentorum by Giovanni de Fontana. The illustration shows a man holding a lamp or lantern, and on the wall is a large projected picture of the devil. The detail of the lantern shows the outline of a small image of the devil." This was the apparent precursor to the modern theatrical "gobo" — a piece of metal or glass, mounted in front of a lighting instrument that is commonly used to project, for example, the shadow of a window or leaves onto the stage.

The first tool that really introduced the use of projections in theatrical performance is the magic lantern, the precursor to our modern (1950s) linnebach, pani

and pigi projectors, and the formerly ubiquitous Ektachrome slide projector (Williams 2012). In <u>Dates and Sources</u>, Franz Liesegang attributes the design of the magic lantern to a German priest living in Rome, Athanasius Kircher, in 1671 (1926, 12), although today most scholars believe he was just the first to describe a design. In fact the famous English diarist Samuel Pepys writes about buying a magic lantern in 1666 (Robinson 1986, 7). The first reference to the use of projection in a theatrical performance is at the Hamburg Opera, possibly in 1726, when a motion-image projection (magic lantern) was used for scenic backdrop (although the performance occurred possibly as early as 1678) (Schubin 2011). Schubin also comments that the projector used in Hamburg in 1726 to project fireworks was made by Pieter van Musschenbroek in Leiden, Germany, in 1720. It can be seen along with several motion-image slides at the Boerhaave Museum in Leiden. Liesegang quotes Edme Gilles Guyot (M. Guyot) who stated in 1770, "'how one could perform entire plays with the magic lantern' and gives <u>The Conquest of Troy</u> as an example." This was found in a side bar note in Liesegang's <u>Dates and Sources</u> (1926, 13).

Later between 1780 and the early to mid-1800s, magic lanterns were used in entertainments called "Phantasmagoria"; burlesque or vaudeville-type productions that often featured ghosts, skeletons, and other spectres projected onto walls, smoke, or on ceilings (Rockett and Rockett 2011, 32-33). In the 1870s and 1880s, Muybridge in the U.S. and Janssen and Marey in France, continued their work in persistence of vision and the creation of moving pictures. According to the secretary of the Paris Opera, in 1886 Augustin Le Prince applied for patents in the U.S. and England for a "Method and Apparatus for the projection of Animated Pictures in view of the adaptation to Operatic

Scenes" and was granted them in 1888 (Schubin 2012). Schubin continues to describe a version of the opera <u>Carmen</u> that toured around the United States in 1896 and featured a film of a bullfight in the fourth act.

The early 20th Century brought the Dada movement and the rise of Epic Theatre. From the late 1910s to the mid-1920s artists such as Yvan Goll and Erwin Piscator introduced film into many of their productions (Bash 2012, history 2). Piscator brought these techniques with him to the United States when he emigrated from Germany in 1938 and consequently exerted influence on many theatre artists of the time (Probst 1991, 14, 51-52). In Tennessee Williams' production notes for <u>The Glass Menagerie</u> he wrote that projections serve "to give accent to certain values in each scene" (Single 2007, 138). Bertolt Brecht himself asserted that;

> "…Piscator, who without doubt is one of the most important theatre men of all times, began to transform its scenic potentialities. He introduced a number of far reaching innovations. One of them was his use of the film and of film projections as an integral part of the setting…This was great progress." (Brecht 1964, 77-78)

In more recent history, The Wooster Group of New York City was formed in 1975 and many of its creations incorporate film and projection. The mission statement in the website of The Gertrude Stein Repertory Theatre — in reference to digital media — states that they,

> "believe that an entire genre of literature developed by visionaries of the late 19th and 20th centuries and often referred to as 'difficult' or 'problematic,' was written for stages and production techniques that had not yet been developed at the time that they were conceived. Stein's repetition, Joyce's sentences, Proust's imagery, and Jarry's philosophies

not only prompt readers to re-think the function of language, they also demand that the artists who explore them re-examine the very foundations of traditional dramatic communication-including the vehicle for presentation."

On May 16th 2013, in the Opera-L Listserv, member Donald Kane wrote: "Projections, however effective, are by their very nature a compromise; they belong essentially to another medium, cinema, and to use them extensively is an admission of limited stagecraft." (http://listserv.bccls.org/cgi-bin/wa?A2=ind1205C&L=OPERA-L&D=0&m=323070&P=45742). This attitude is rather widespread and a true failure to acknowledge the history of theatre production and the willingness of its designers and craftspeople to continually push the limits of all the available tools in artistic creation. Mr. Kane was commenting on the newest production of Wagner's Siegfried at the Metropolitan Opera, directed by Robert Lepage.

If the integration of any aspect of a production design is poorly conceived, then it won't work. Stanley McCandless' 1932 treatise, A Method for Lighting the Stage was a direct response to those directors and production artists (there were no lighting designers then) who were using the new tools of bright, electric, focusable lights, and dimming systems to the point of distraction and were no longer supporting the story but producing brightly lit spectacles. Projections in theatre are certainly not new, but with the stunning array of current tools available, artists and craftspeople must always remember that they are there to support the story, not be it.

According to Brett Jones and Rajinder Sodhi, two PhD candidates at the University of Illinois at Urbana Champaign, the terms "projection mapping" or "video mapping" are fairly recent additions to our lexicon. In their website, projection-mapping.org, they say it used to be referred to as "spatial augmented reality" and the first example that they mention was used in 1969 for Disneyland's Haunted Mansion ride. Film of ghostly singers was projected onto plaster busts to make them "come alive" during a sequence in the ride. Other examples of art installation pieces followed in the 1980s, while research into projections and immersive environments continued in the 1990s to the present.

As of July 2013, Vimeo, the free online video sharing website, has a group for "Projection mapping" and it has 824 videos listed. The site proper has over 3,300 links to videos that have been tagged with "projection mapping". Most of those links are for commercial advertising or a celebration of some public event. They are almost exclusively projected on large exterior surfaces. Some of the videos link to installation art — mostly smaller scale and presented in interior locations. There are two major permanent installations that I could find. One is at the Hala Stulecia museum of Architecture in Wroclaw, Poland and takes place inside the huge concrete dome structure. The second is a presentation that lights up the exterior of Bréda Castle in Hungary and opened in May of 2013.

Projection Mapping Central (projection-mapping.org) lists 42 different companies — advertising agencies, artist collectives, and event companies — around the world that specialize in creating projection mapping "events". Two of the companies listed are from

Canada; Tantrum Design and Visual Effects from Toronto is a full service advertising agency with a couple of big exterior mapping presentations, and Moment Factory out of Montreal has some very big clients and an incredible portfolio of large scale work around the world. When it comes to theatre in Canada, the independent production consultancy and design firm, Playground Studios out of Toronto, has helped to design and create such productions as <u>Bigger Than Jesus</u> and <u>The Highest Step in the World</u>. In <u>The Highest Step in the World</u>, they sequentially mapped a human skeleton, muscles, skin, and finally a uniform upon the sole actor who wore a white jump suit. Theatre companies such as the Electric Theatre Company out of Vancouver have been producing theatre with a strong emphasis on visual imagery since 1996. Their play <u>Studies in Motion</u> was inspired by the life and work of Eadweard Muybridge and integrated many pieces of still and moving images all over the set and various other surfaces. Jacques Collin, a video and projection designer from Montreal, who has produced most of the projections for Robert Lepage's solo shows, mapped the scenic content for Sampradya Dance Creations production of <u>Taj</u> at the 2011 Luminato Festival in Toronto. And finally, another Montreal design firm, Roger Parent's Realisations, mapped the projections for Robert Lepage's <u>Der Ring des Nibelungen</u> for the Met Opera in New York.

Video mapping is continually becoming more popular with people who run music and dance clubs as yet another tool for entertaining their clients. As such, the different software packages used first to map the surfaces and then secondly, playback the content, are becoming more integrated. One software package is MadMapper, for Mac, which combines these procedures into a much less obscure process. Video mapping is becoming

so popular around the world that Toledo Spain just held a contest for participants from around the world, under 30 years of age, to project onto the main gate of the San Juan de los Reyes Monastery. With opportunities like this and others such as the annual Mapping Festival in Geneva, I believe it is only a matter of time until we will see more video mapping integrated into live theatre performances.

Chapter 2

Set Design

The director and I discussed the role of time and place in the script and we came to the conclusion that changing the time period of the production from 1982 to present certainly would have made costuming the second and third acts much easier, but the dialogue and references would all have to be adjusted as well. While I do contend that the first act play has some dream-like qualities and that moving that act only in time might have very few consequences. However the references alluded to in the second and third acts of the script, taken out of temporal context, would make it even more challenging for the audience. The anachronistic first act and the chronological year-back jump of the third act — as commented on in many of the reviews of past performances — already confused some audiences. Changing the location would have introduced more issues than it would have improved. The class structure, which is such an important premise of the play, is not as clearly defined in North America. Margaret Thatcher, the "Iron Lady", was Churchill's impetus for writing Top Girls — the right-wing conservative made things much harder for women in the United Kingdom, and Churchill couldn't conceive of a feminism that was separated from socialism (Betsko and Koenig 1987, 78). I do not believe that there were any suitable North American women who could replace the unseen presence of Thatcher in the text. The questions of time and place were raised with the director and he requested that the time and location of the play remain unchanged.

After discussions with the director, we agreed that using projections as the primary scenic driver of the production would be an effective method to overcome the visual limitations created by producing the show in a thrust theatre. There are six distinct locations called for in the script: the restaurant, the Top Girls Employment Agency main office in London, Joyce's backyard in Suffolk, an interview room at the agency, Marlene's office in the agency, and Joyce's kitchen. The ability to create some version of each location using a physical 'set' are limited by the sightlines afforded in the Theatre of the Arts at the University of Waterloo. I believe that the unique qualities that digital media can bring to live presentation as described in the Gertrude Stein Repertory Theater mission statement are more easily met by using animated projections rather than the static, scenic images I used in Top Girls. Animated projections can more easily punctuate a thought, support an esoteric idea, or create a totally different world, as they themselves can become active characters or storytellers in the scene. The movement created using static images is similar to the movement created when using static lighting instruments in a lighting design — movement happens through changes between fixed instruments and their intensities. That type of movement can easily suggest changes in time or location. I don't think that when using static images specifically for scenic or prop purposes that they can attain the same goals as described above. Static images can certainly punctuate deeper meanings in the text if they leave the intention of scenic support — I could imagine images of Thatcher being lauded by world leaders alternating with images of the hunger-strike protests and the egg-throwing of 1981 being projected over the final

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argument between Marlene and Joyce. This type of use has no appeal to me as it seems heavy-handed.

My initial intention when creating the images for <u>Top Girls</u> was specifically for scenic support and to generate some of the props — simple static images that could answer the need for distinct, multiple locations in the thrust theatre. After deciding on projecting the floor treatment as well as the back wall, I considered other potential uses of the projections that were hitting the horizontal (albeit raked) surfaces. The idea of mapping some of the props onto those horizontal surfaces such as the tables arose from those considerations. Food can be a very difficult and costly prop to maintain for a run of a production, so it became the first choice for potential mapping candidates. I hadn't considered the option of using animated projection until a idea came to me during a technical dress rehearsal, but by then it was certainly too late to integrate it into the production. I thought about introducing cracks or fissures into the floor image of the kitchen during the last scene of the play as the family issues become more permanent. The director and I discussed the missed opportunity, but nothing more came of it.

I had access to funds to purchase three, Epson Powerlite 905, 3,000 lumen projectors with a native aspect ratio of 4:3 — the same aspect as an old cathode ray tube television. This aspect ratio is important as it defines the shape of the projected surface, and along with the throw distance, the maximum size of the projected surface available. I also had access to an existing, much larger, and brighter projector, a Christie Digital

LX66, which was capable of filling the upstage false proscenium and its associated rear-projection screen.

The director liked the idea of the projection surfaces acting as the raked floor of the set and having sharp, clear edges. With three projectors available to project down to the floor (risers), I could have three, distinct projection surfaces. Two abutted surfaces would serve the up-stage and mid-stage deck, the third surface — centred at the bottom of the first two — would serve the centre and down-stage areas. The raked floor would look like an upside down pyramid of box shapes. We decided that the sharp transitions between the upper and lower surfaces would not be filled in as the unadorned, no-nonsense look of the deck seemed to suit the personality of the lead character Marlene. The projections on the deck will not just act as a floor cloth, presenting each scene's floor surface as carpets, grass, flooring or other textures, but also mapped projections on the tables and chairs of each scene creating the table cloth and foods of the restaurant, the desks and associated papers of the agency, the tent of the girls in Joyce's backyard, and the kitchen table and counters of her kitchen (Production Analysis in Appendix A). The images for projection will be created from a compilation of sources: photographs, CAD drawings, and sampled textures from the internet. The images will then be manipulated using Adobe Photoshop Elements 11 photo-editing software to build each scene's digital texture.

The rear projection screen will also be used to project representational locations for the scenes; in the restaurant, the agency, the yard, and the kitchen. The rear surface

might also be used as an informational tool before each act, projecting text announcing Churchill's own titles for the acts: The Dinner, Angie's Story, and One Year Earlier. The projections on all surfaces will be realistic, but simplified. Although it would probably make sense that the grass in Joyce's backyard might be worn in places, too long in others, and have more than its share of weeds, I believe such hyper-realism might distract the audience from the text by encouraging them to look for those identifiers that make it real. The agency office and the kitchen will also have just those aspects that identify them for what they are, to try and keep the attention on the story. I have in the past built incredibly detailed, hyper-realistic three dimensional sets; they are truly a beauty to behold and truly support the text. However, I am concerned that including such detail in photographic realism might be a distraction (Projection Drafts in Appendix C). The major props will be three identical white tables that will become the dining table, the tent, the desks, and other raised surfaces as required. The six white chairs from the dining scene will become the office and kitchen chairs in later scenes (Set Renderings in Appendix B). The waitress will probably carry a tray with empty white plates that will have their food projected on them. Other than some file folders, many of the props will be digital.

I passed the construction drawings on to the technical director (TD) of the University of Waterloo Drama Department in November 2012. The drawings on the next page (Illustration #1& 2), started a conversation with the TD about best methods for construction for a 20 foot deep raked stage.
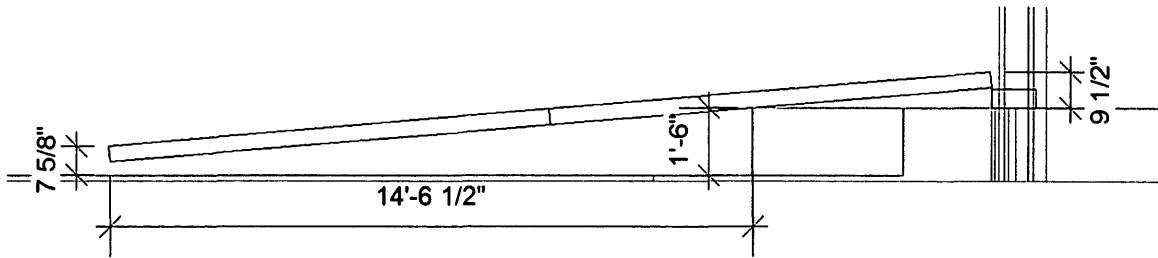
Construction drawings – section view shown without support structure   Illustration 1
(not to scale)
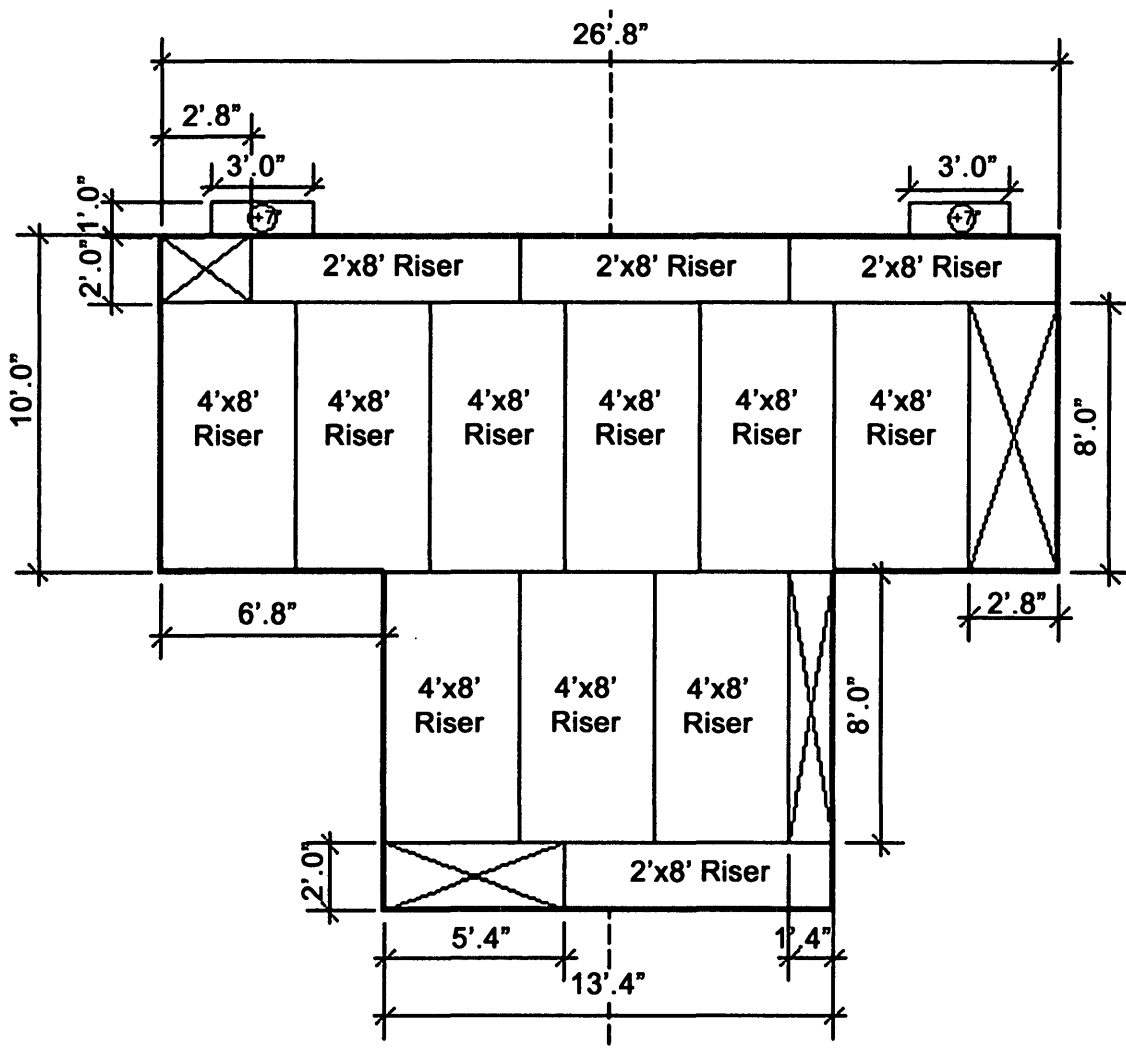
Construction drawings of the set – plan view   Illustration 2
(not to scale)

By using the department's existing stock of 4′x8′ and 2′x8′ risers (platforms), the crew would just have to build four small risers (marked with an "X" on the plan, Illustration 2) and put vertical posts, called "legs" underneath at the appropriate height by using the section drawing (Illustration 1). The risers all lock together, so stability wouldn't be an issue. The TD suggested that rather than using existing risers, engineered wood I-beams would create a solid surface that would be easy to assemble, maintain the slope of the raked stage, and add some valuable "tools" to the existing stock for future productions. I agreed to the change.

Hardware, Software, and Math

In order to define the size of each of the previously described three projection surfaces — risers — on a rake, many variables had to be taken into consideration: the native aspect ratio of the projectors (the 4:3 referenced earlier, as opposed to the now more common 16:9 widescreen), the lens focal range of each projector (the width of the image projected is directly correlated to the lens focal range — similar to the wide-angle and telephoto zoom settings of your camera), and finally the throw distance from the front of the lens to the projection surfaces or screens. The first measurement that had to be taken was the throw distance. In order to make the projections easily viewable from most of the seats in the house, the projection surfaces needed to be raked. As the University of Waterloo Drama Department follows the Canadian Actor's Equity Association standards for live performance, the slope of the raked stage could not exceed

one inch (1″) over one foot (1′). It is possible to exceed this in professional theatre, just not without special permission and additional monetary compensation to the actors for a potentially hazardous, unconventional work environment. In the Theatre of the Arts at Waterloo (Illustration 3), there is a raised 'apron' of eighteen inches, crossing five feet from the false proscenium wall, adding another fixed point to the mix. Using that fixed point, and adding that the depth of the stock risers available is 4.25″, I now had a fulcrum point and maximum slope with which to draw the surface of the projection risers.
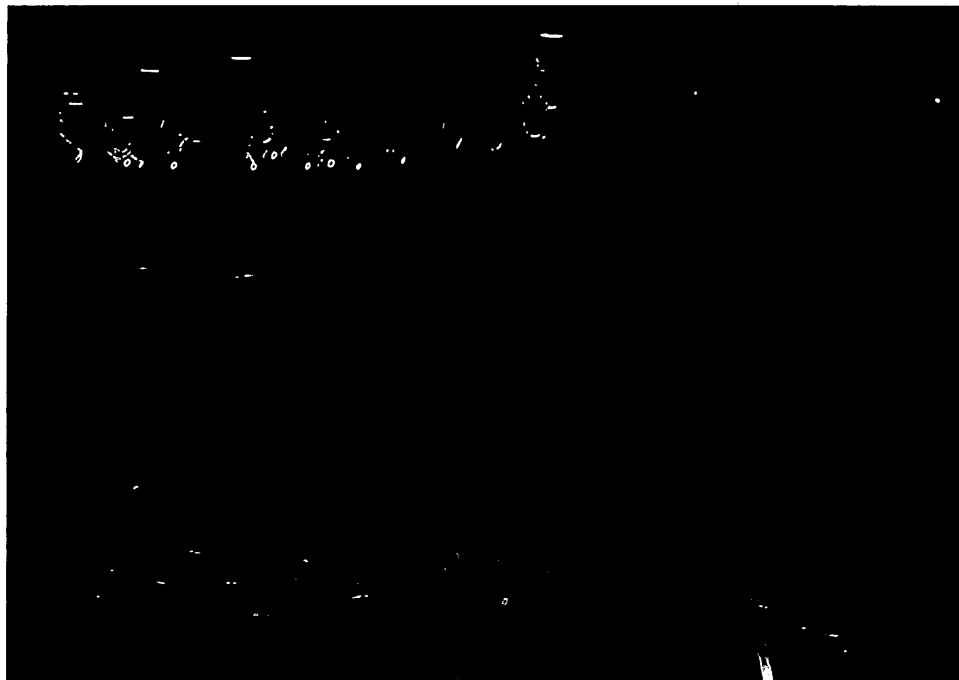

Theatre of the Arts - Photo by author   Illustration 3

The three projectors available for projecting on to the raked stage are Epson PowerLite 905's and each have a 3000 lumen output, a 4:3 native aspect ratio, and a 1.6 optical zoom giving them a 1.38 − 2.24 throw-ratio range. Epson's website

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(http://www.epson.ca/alf_upload/landing/distance-calculator/) has its own proprietary

throw distance calculator, but it is also not very easy to read. The website Projector

Central (http://www.projectorcentral.com/Epson-PowerLite_905-projection-calculaor-

pro.htm) has a much easier interface and after comparing many different scenarios, I

decided that the math was consistent between the two sites. Once I sketched the raked

surface, I drew a perpendicular line from the approximate centre of the riser to above the

lighting grid in the canopy over the deck. The potential throw distance for the projectors

appeared to be approximately 18'-9" for the up-stage projectors and about 19'-7" for the

down-stage one (Illustration 4).
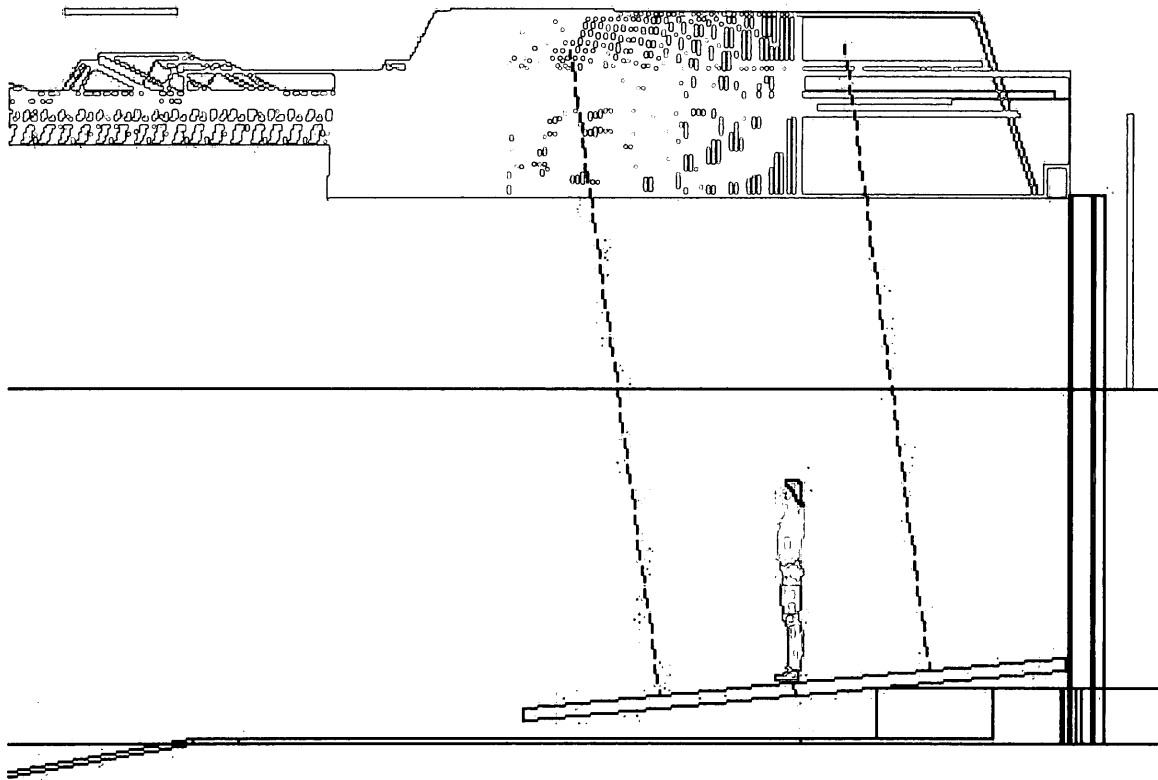
Section view of the set on stage showing projector throw paths   Illustration 4
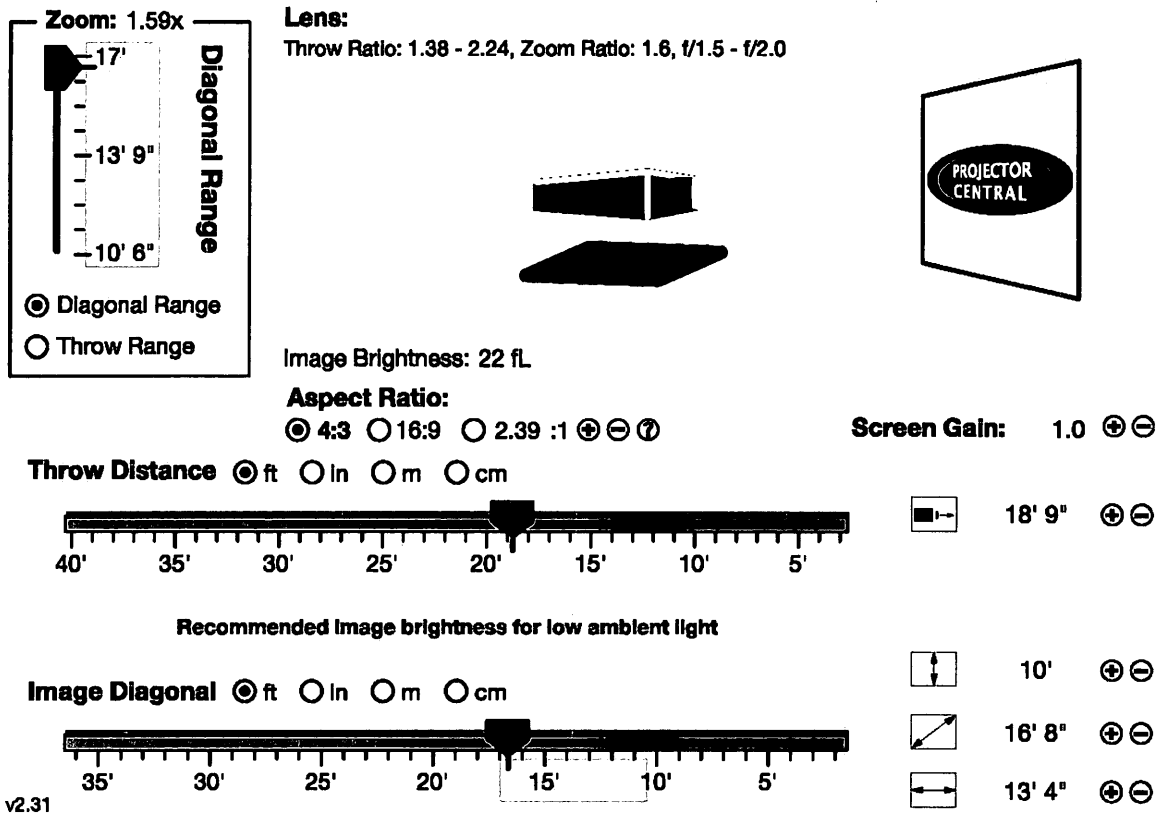
Now that I had the throw distance, I could enter that into the calculator and define a width or depth of the surface. For construction purposes, a depth of 8′ would make the use of stock risers very easy, however, that would only give 16′ of overall depth on the stage. I decided to work to a depth of 10′ for each surface to maximize playing space while keeping the construction costs at a more manageable level. Using the Projector Central calculator with the projector model, the throw distance, and one fixed dimension (the 10′ depth), the resultant calculation was 160 inches, or 13′4″wide (Illustration 5 and Figure 1).

26'-8"

Rear projection screen

edge 1'-4" above thrust

10'-0"

10'-0"

edge 1'-2" above deck

13'-4"
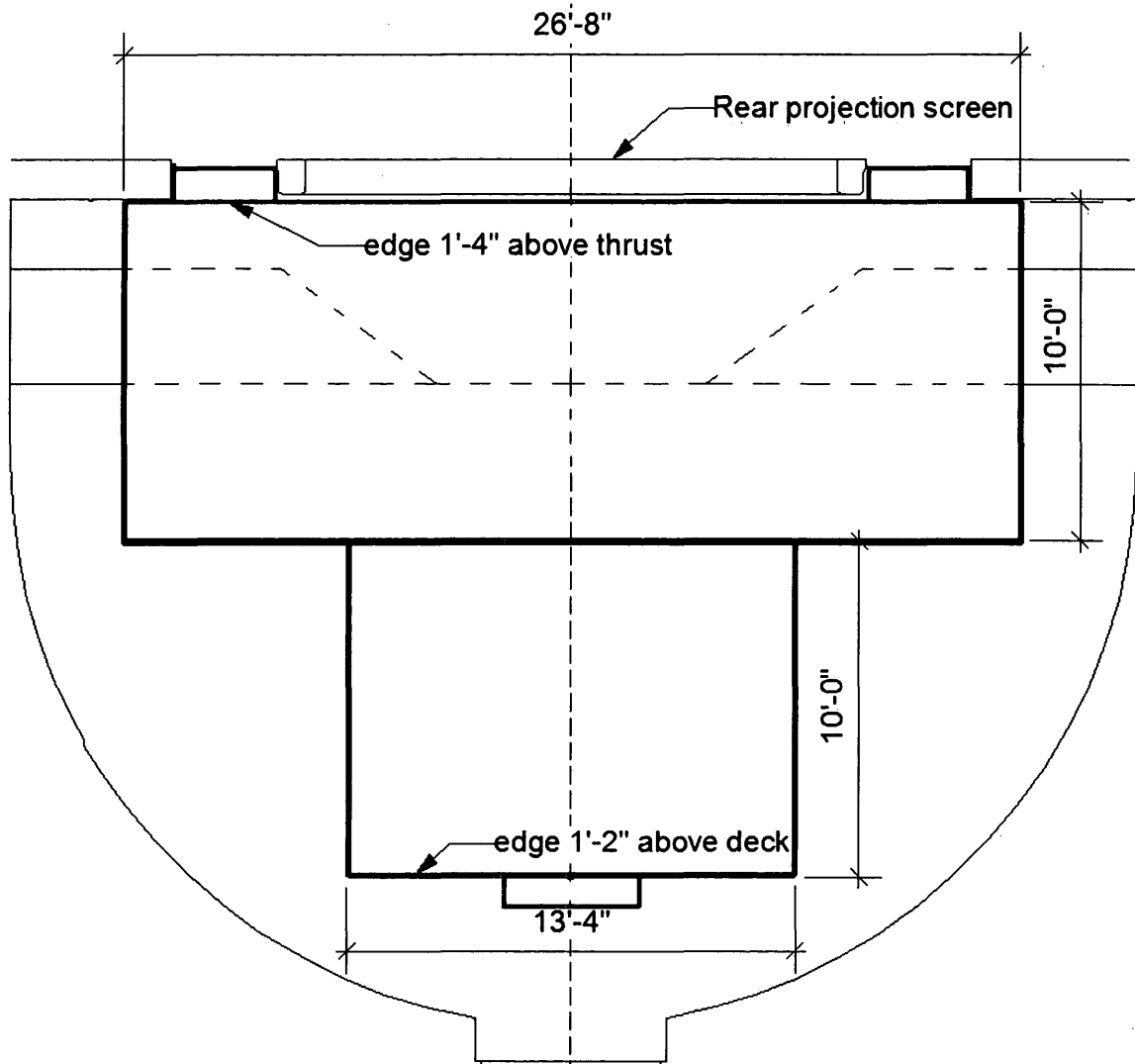
Plan view showing basic dimensions of the projection surface
(not to scale)

Illustration 5

Epson PowerLite 905 Projection Calculator

Lens:
Throw Ratio: 1.38 - 2.24, Zoom Ratio: 1.6, f/1.5 - f/2.0

Zoom: 1.59x

17'

13' 9"

10' 6"

Diagonal Range

◉ Diagonal Range
○ Throw Range

Image Brightness: 22 fL

Aspect Ratio:
◉ 4:3 ○ 16:9 ○ 2.39 :1 ⊕ ⊖ ⑦

Screen Gain: 1.0 ⊕ ⊖

Throw Distance ◉ ft ○ In ○ m ○ cm

40'   35'   30'   25'   20'   15'   10'   5'

18' 9"   ⊕ ⊖

Recommended Image brightness for low ambient light

Image Diagonal ◉ ft ○ In ○ m ○ cm

35'   30'   25'   20'   15'   10'   5'

v2.31

10'   ⊕ ⊖

16' 8"   ⊕ ⊖

13' 4"   ⊕ ⊖

Projector Calculator throw distance based on 18'-9"

Figure 1

Before explaining the results of the chart in Figure 1, a clarification of what all the

numbers and graphics represent would be in order. The top centre title refers to the

projector being examined and as many professional projectors can have interchangeable

lenses, the attached lens is also indicated — in this case, a lens with a throw ratio of 1.38

– 2.24. A projector with a throw ratio of "1" would create an image approximately 10'

wide with the projector 10' away from the surface. For the Epson 905 projectors, This

ratio would suggest that one of these projectors ten feet away from a surface could create

an image that measures approximately 5'-7" across (1.38) to 7'-3" across when the lens is

"zoomed" out (2.24) — a difference of zoom ratio of 1.6x overall. The "Diagonal Range"

box to the upper left indicates that zoom ratio as a graphic — from 1x at the bottom

(marked 10'-6") of the blue bar to 1.6x (in our case) at the top (marked 17') of the blue

bar. The "Image Brightness" text in the middle of the figure, in this case "22", refers

exactly to that — the brightness of the image at the established throw distance. It is

measured in "fL", foot-Lamberts. For elucidation, the professional organization that is

involved in movie theatre projection (SMPTE: Society of Motion Picture and Television

Engineers) suggests a minimum of 16 fL's for movies in a darkened theatre (Happé 1971,

312). While 22 is almost 25% "brighter" than 16, the 16 was the minimum luminance for

a darkened cinema, not one working with theatrical lighting. Time will tell if it is bright

enough, as that is the maximum brightness that these projectors can produce from that

distance. The aspect ratio of the desired image can be selected; 4:3 is a standard

television; 16:9 is a modern, wide-screen TV, while 2.39:1 is similar to the old

Cinemascope in movie theatres. The next graphic down, the "Throw Distance" is where

a user can enter the desired distance from the projector to the projection (currently

measured as 18'-9") surface in various measurement formats. Below that, the other

graphic named "Image Diagonal" will show the resultant dimensions (in height,

diagonally, and width) from the selected throw distance. It is also possible using this

calculator to enter the desired dimension in height, diagonally, or width and get the

resultant throw distance. The tinted area below the "Image Diagonal" graphic correlates directly the "Diagonal Range" box in the top left.

In Figure 1, with the Top Girls required data entered, the "Diagonal Range" box in the upper left, the lens is almost at the maximum diagonal range for the projector. This does not allow much room for error or change due to unforeseen issues in the placement of the projectors. The other issue that has become apparent after a test is the issue of video shadow. With the projectors shooting their images completely perpendicular to the surface, elevated surfaces such as tables and chairs will have a perfectly perpendicular video shadow underneath them. This might not be the most aesthetically pleasing look. By shifting the projectors downstage, the video shadow would shift upstage to an area that might not be so apparent to the audience. Another benefit from moving the projectors is that I gain some throw distance and thereby also take the zoom from almost maximum width to a point where there is at least some room to adjust.

There is one other adjustable space on the Projector Calculator marked "Screen Gain" (marked 1.0). The gain, or reflectiveness, of any surface is dependent on the surface materials. The stage is painted with a regular white scenic paint with a matte finish. In an effort to try to find a method to increase screen gain, I attempted a simple test by adding a gloss paint glaze to a painted sample of the floor material. These tests suggested that glaze was not going to help and that a clearer image would be had from the bare paint. The glaze produced what seemed to be "hot spots" that resulted in a yellowing of the image.

The next step in the process after creating the images to be projected, is deciding on whether the device used to playback video cues during the production would be driven by software on a stand-alone computer or a hardware-based, proprietary multimedia server. The variables in this instance are the resolution of the images and the complexity of the video used, the number of distinct outputs required (in this case, four), and finally the quality of all the hardware between the playback devices and the projectors. I spent part of August 2012 interviewing experienced users and suppliers of both types of systems as well as testing some products myself for intuitiveness and ease of operation.

I already possessed an Apple iMac with appropriate photo and video editing software along with audio/video playback software called Qlab. I also had access to a couple of Matrox Triple-Head-2-Go video hardware boxes, which simply turn video monitors into three distinct outputs. As I knew I would require four distinct outputs, the Matrox hardware would not suffice. A colleague suggested I look at the Datapath X4, a similar piece of hardware to the Matrox, but with four outputs and a lot more functionality. While the Matrox simply communicates to a computer that a screen is three times wider than it is (for example, a very basic screen resolution of 800 pixels wide by 600 pixels high would appear to a computer as 2400 pixels wide by 600 high), the Datapath is capable of a lot more. The Datapath could not only send four output signals, but each of those outputs could be set to display a specific portion of the screen. In its simplest set up, the Datapath would divide the screen into four equal quadrants dividing each of those quadrants between one of the outputs. For this production, an image would

be equally divided into three "floor" sections for the top projectors, and one section sent to the rear projector as a "wall". I purchased one.

Challenges

It was after I had built the projector mounts and finally got them up to the lighting grid above the stage that I discovered that I had made a mistake. With the "agreed to" change of the height of the risers, projection issues started to appear. The stage had also been built 1.125″ wider on each of the sides and 1″ deeper on the downstage edge than what was requested. The now larger stage, while only inches bigger than what was indicated on the drawings, added almost 10 square feet to the projection surface. Each projector could only illuminate 133 square feet with the existing projector mount positions. I had measured the throw distance based on using the existing stock risers which were 4.25″ high. The newly built stage, using the engineered I-beams with a ¾″ plywood top and ¼″ hardboard top surface, was just less than 11.25″ high — a difference in height of 7″. The projectors were already close to their maximum range for their throw distances; shortening the throw by 7″ was quite the difference. That loss of throw distance meant that the maximum width of an image projected by a projector would be smaller. As drawn, the upstage projectors maximum throw distance was 18′-9″ — with the loss of 7″, that maximum was exceeded. The Projector Central Calculator was used again (Figure 2) and with the zoom range of the "Diagonal Range" now at its maximum, and the "Throw Distance" adjusted to 18′-2″, the projectors were calculated to lose about 2″ per side, or just over 2.5 square feet of image per projector.

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I continued to look for methods of obtaining a new, single projector with an ultra-short throw lens that could cover the whole stage with a bright enough image to replace the three existing projectors that now were limited in their coverage. As this thesis' intent is to demonstrate that these methods are affordable, many solutions such as renting from a large audio-visual equipment supplier — or almost as expensive, buying a brand new projector — are beyond the limited budget. I made the choice to edge the now smaller projection surfaces with black paint, creating a picture frame effect for the images. I think the process of design in theatre tends to be fluid — continually adjusting to the discoveries of the director and actors in rehearsal, or responding to the vagaries of materials, machines and people. The ability to respond and adjust appears to be an essential asset in theatre design.

I also continued to swap out and re-arrange the hardware and software being used for playback of the images in an attempt to find the most efficient and easiest method to troubleshoot the system. This would allow any second-year student operator to have the most beneficial learning experience with the least amount of frustration while supporting the production. The system should be designed so that the student operator, if need be, would be able to identify and troubleshoot any issues which might arise. The Datapath hardware, mentioned earlier, does not have a usable Mac software interface for controlling the selectable areas of the computer screen for output. Consequently, I moved the playback system from my iMac to a PC.

The images were created using Trimble Sketchup and Adobe Photoshop Elements, then imported into free playback software called Screen Monkey, a PC based video and audio player. There are two DVI monitor outputs on the back of the computer, one is the main screen — it drives the main video monitor that is controlling all the software. The second video output goes to a simple "Y" splitter. One branch drives a second video monitor so that the operator can see the video playback, while the second runs a cable from the backstage operations centre behind the rear projection screen to above the main stage risers in the lighting grid. That cable drives a Datapath x4, a piece of video hardware that can split up a DVI signal into for separate, variable-sized images. Three of those outputs drive the three Epson projectors in the grid while the forth is connected to another long cable that goes backstage to the Christie projector that rear projects on to the wall. You will notice in Appendix C, Projection Drafts, that the images are divided equally into four quadrants after heading out of the Datapath.

Epson PowerLite 905 Projection Calculator

Zoom: 1.62x

Diagonal Range

16' 5"

13' 4"

10' 2"

◉ Diagonal Range

○ Throw Range

Lens:
Throw Ratio: 1.38 - 2.24, Zoom Ratio: 1.6, f/1.5 - f/2.0
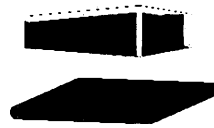
PROJECTOR
CENTRAL

Image Brightness: 23 fL

Aspect Ratio:
◉ 4:3 ○ 16:9 ○ 2.39 :1 ⊕ ⊖ ⑦

Screen Gain: 1.0 ⊕ ⊖

Throw Distance ◉ ft ○ in ○ m ○ cm

```
40'    35'    30'    25'    20'    15'    10'    5'
```
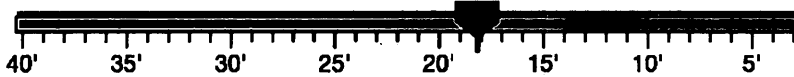
■▶   18' 2" ⊕ ⊖

Recommended image brightness for low ambient light

Projector Calculator throw distance based on 18'-2"

Image Diagonal ◉ ft ○ in ○ m ○ cm

```
35'    30'    25'    20'    15'    10'    5'
```

v2.31

↕   9' 10" ⊕ ⊖

⬈   16' 5" ⊕ ⊖

↔   13' 2" ⊕ ⊖
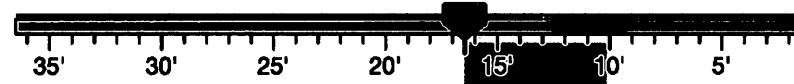
Used with permission from ProjectorCentral.com. Copyright 2013.
ProjectorCentral.com. All rights reserved.   Figure 2

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Chapter 3

Costume Design

Once deciding that the play will be set within the time when it was written and as such will be primarily costumed in late 1970s, early 1980s clothing, a descision must be made concerning the real and ficticious characters from history, literature, and art that populate the first scene. Many of these characters lived through distinct periods in their own lives. Isabella Bird, for example, spent the first 40 years of her life housebound, looking after her family until 1872. Lady Nijo was first a concubine to the Emperor of Japan in the 13th Century before becoming a Buddhist nun around the age of 25. Patient Griselda from Chaucer's text and an earlier 14th Century Italian text, started out life as a peasant, married a squire, was sent back to her father for years, and then brought back into the squire's life. The question becomes; at what point in these characters' lives do you base the costumes? I have decided, after consultation with the director, that all of the costumes will be centred in the last clear period of the characters' lives — when the women were at the peak of their decided "career" choices. These are the women who Marlene chose to dine with, and so it would make sense that they would already be well established in their chosen "fields" as she probably looks to them to validate her own success.

I produced a scene breakdown with the actor casting (Table 1, pg. 24) to identify any quick change issues that could affect costume designs. As published, the Samuel French edition has only one act change — after the backyard scene (Act II.ii). In that

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edition, two actors — including the one playing Marlene — would have a fast costume change. If the backyard scene opens Act II, then in our production, the actor playing Jeanine will need a fast change into her character Win, from Act II scene ii to Act II scene iii. The costume designed for Win could easily be worn under the costume designed for Jeanine, making a fast change easier.

The costume designs for this production are not much different than I would have designed for a production without projections. Most of the colour pallete chosen for the costumes should escape too much recolouring from the projected images. The only costumes that are of a concern are Jeanine's skirt, Win's now coral coloured dress, and Nell's off-white jacket. But as those costumes appear only in the office location, the neutral colour of the floor covering shouldn't create too much of an issue. The colour, unfortunately, is just one of the concerns — there are also the patterns, or textures used in the images showing up on the costumes as well. At this point, I am at the mercy of the lighting designer, Kirsten Watt, to wash out those projected colours and textures on the costumes while at the same time, not lighting the floor, the back projection screen, or the table tops in all their various postions. As there are no side lighting postions in the house (side lights in a proscenium theatre are an essential part of dance lighting as it accentuates the body) the TD and I placed six, temporary side lighting postions in the house to assist the lighting designer in achieving this goal.

Top Girls - Scene/Actor Breakdown

Actor (Character)	I.1a	I.1b		II.1	II.2	II.3a	II.3b	II.3c	II.3d	II.3e	II.3f		III.1a	III.1b	III.1c
Cassandra Cline (Marlene)	Marl.	Marl.			Marl.	Marl.		Marl.	Marl.		Marl.		Marl.	Marl.	Marl.
Jennifer Gooderham (Waitress, Jeanine, Win)	Wait.	Wait.			Jean.	Win	Win				Win				
Meghan Jones (Isabella, Angie)	Isab.	Isab.		Ang.				Ang.	Ang.	Ang.	Ang.		Ang.	Ang.	Ang.
Michelle Kestle (Nijo, Mrs. Kidd)	Nijo	Nijo							Kidd						
Sydney Spidell (Dull Gret, Nell)	Gret	Gret				Nell				Nell	Nell				
Andreea Hluscu (Pope Joan, Joyce, Louise)	Joan	Joan		Joyce			Loui.						Joyce	Joyce	Joyce
Carleigh MacDonald (Griselda, Kit, Shona)		Gris.		Kit						Shon.				Kit	

Character Breakdown

Isabella Bird (1831-1904), was born in Edinburgh, Scotland, and travelled extensively between the ages of 40 and 70. There are many photographs available for research. I would dress her in a tweed travelling skirt with matching jacket, paddock or riding boots, and driving cap.

Lady Nijo (1258 – c.1307), was born in Japan and was raised as the Emperor's courtesan. In 1283 she became a Buddhist nun. As a nun, she would be dressed in a simple robe or kimono with a zukin (a Buddhist wimple).

Dull Gret, a character from a Brueghel painting (painted circa 1562), is an iconic image — a woman who's out for blood at the loss of her children. As she is only a character in the painting Dulle Griet, there is not a lot of choice in design. In the painting, it appears that she is wearing a wool skirt, leggings, cotton shirt, wool top, breast plate, leather helm, and a gauntlet on her left hand.

Pope Joan, according to legend (possibly Pope circa 854-856), was stoned to death after giving birth. She would wear liturgical garments, a white alb with white rope belt, red mantum, slippers, camauro, and maybe a ring on her right hand.

Patient Griselda, a character from literature (Chaucer wrote The Clerk's Tale of The Canterbury Tales about 1390), was based on an earlier Italian story. She will appear well after her reunion with her squire husband, so she will be well dressed. I would dress

her in a wide-sleeved bliaud (embroidered at hem and sleeves), cinched at waist over a white chainse, a short veil, and slippers.

Marlene at the start of the play is 34 years old, and as Mrs. Kidd in Act II, Scene i describes her, "a ball breaker" (Churchill 1982, 70). I would dress her in a business suit in the dining scene to set the character. She mentions in the text that she wears a skirt and blazer in the office, but always of a darker colour, probably blue. In the third act at Joyce's, she would wear pants again and preferably a button up sweater over a nice blouse. Marlene will always wear some jewellery and a watch.

The waitress will wear a short black dress and comfortable shoes — the standard uniform for the businessman's server. The restaurant probably caters to the executive lunchtime crowd, so the waitresses expect men who tip well.

Jeanine is only 20 and works as a secretary. She's come hoping for a job in advertising. Marlene suggests to her that she might appear and dress a little too plainly for a position that carries expectations of extroversion. She could wear a little gingham-print blouse, floral skirt, and flats. She probably would not wear any makeup.

Marlene's older sister Joyce is approximately 37 years old, and has been a housewife and cleaning lady for almost 20 years. She would wear jeans and a sweatshirt in the first scene and jeans and a plaid shirt in the last scene. She should wear running shoes and wear no makeup or jewellery.

Angie is 16 and is an active girl. In her first scene, when the girls are outside she is in a jean skirt and maybe a sweatshirt or t-shirt on top. Later in the scene she puts on a dress that is too small — a gift from Marlene a year earlier. There will need to be two different sizes of the dress as it must appear to fit properly in the third act. Since the dress must be suitable for a Christmas present, it should be pretty, sharp, and no-nonsense as a dress Marlene might think a 15 year-old would appreciate. She will wear jeans in the second act when she visits London, and later at home in the third act. Cardigans over t-shirts and runners on her feet complete these looks.

Kit, Angie's friend, is 12 years old. She will wear a play suit in the first scene and a romper in the next. She will wear the same running shoes in both.

Nell is one of the employees of the agency and it seems like she wishes to follow in Marlene's footsteps. She should wear a blazer over a dress, although the clothing may not be of the same quality as Marlene's. Nell's makeup might be a little too overdone.

Win is also an employee of the agency; she too is a mover and shaker, though she comes across as a little more humane. I would dress her in a chic, A-line sleeveless coral shift — overall, a very well dressed young lady.

Louise wants to be a client of the agency, but at 46 years of age, looks a little behind the times compared to what has been seen so far in the production. She should wear a sensible, non-descript light brown dress and shoes as if to blend in with the walls that surround her.

Mrs. Kidd is the wife of Howard, the man who did not get Marlene's job. The fact the she shows up in the middle of the day to ask Marlene to step down could suggest that she is primarily a housewife, so her clothing might be her Sunday best, but from a period of about ten years earlier. She could wear a faded dress with a geometric pattern, low-heeled shoes, and carry a purse.

Shona is a potential client of the office who is around 21 years of age, but selling herself as 29. She would want to appear aggressive and fashionable, so she could wear a low-cut top, tight black pants, and high heels.

Costume renderings and costume plot follow in Appendix D and E respectively.

Epilogue

Conclusion to "A Realized Theatrical Production"

The biggest discovery for me in the realization of this thesis production centres on the wardrobe design — the amount of time required and how comfortable I was with making (seemingly appropriate) decisions. It was a bit of a surprise as the largest segment of text in the written portion of my thesis concerned the projections and the methods used to create them. Possibly this was because I am very comfortable with the technology which was needed and the work required, so that the challenge to get the images on to the stage was purely one of mechanics — the aesthetics of the image choices aside. The costumes proved to be a true challenge of my skills and I think, overall, they were successful. My available time continued to be one of the biggest trials; though I have believed that limitations are important in the creation of artistic work — too much time or money can be more of a detriment to the creative process. Pieces can be overworked, overdone, or just over-the-top without constraints. Unfortunately the constraint of available time in this case became an impairment as I would have liked the opportunity to work a little longer on the projections in order to create a bit more personality into the scenes rather than the almost generic images that I created. The office walls could have had art or bookshelves, the kitchen needed some personalization, and while the backyard did have an indication of a corrugated steel hutch, it could have used more of the detritus of life.

Overall, I think the production was successful. The projections functioned as expected and the images created to be projected — although simplistic or even

provisional — supported the storytelling without becoming their own story. I had stated earlier that I wanted the projections to be "realistic but simple" and I think I met those goals. I was very happy with the how well the food in the first act worked with the script — both in look as well as function. As the blocking in this scene was fairly constrained, the stage lighting did not touch the tabletop at all although audience members in the lower half of the theatre wouldn't see them as easily due to the elevation. I did ensure that at minimum, the bread in the bread baskets could be seen by those members even in the first row by elevating the surface inside the basket. The intent of projecting the papers into the file folders became a moot point as I didn't want to change what became the actor's blocking with the folders in order to satisfy an unimportant, technical "bit of business". I think the only thing that would have made the prop projections more effective would have been a steeper rake to allow more of the audience to easily see their presence.

I also believe my costume designs met my goals as well. I know that the research for period appropriateness was complete and that the costumes represented the various characters with similar aptness. My inclination that I was on the correct track started when I first saw the majority of the costumes that were pulled, borrowed, and built hanging from a large rack in the costume shop and the palette was consistent and clear. I started collecting and selecting various bits of jewellery and other character identifiers and those choices appeared correct, but again, had I more time, I would have liked to gone a bit farther. I felt as if I had just done a first pass with all of the characters.

My relationship with my other collaborators, the director — Saul Garcia Lopez, and the lighting designer — Kirsten Watt, worked out fairly well in the end. While normally a set and costume design discussion is a fairly collaborative process — usually in favour of the director — this time the design was fairly complete in my head even before a director was found. Saul agreed to work with the design as described with only a few minor costume changes (a V-neck dress on the waitress and a change from yellow to coral for Nell's dress), and appeared to be quite happy with the final results. The challenge that I gave Kirsten as a lighting designer I describe as giving her a needle and a hemp rope and then asked her to sew. As most of the blocking in the first act — the restaurant scene — was fairly static, Kirsten didn't have much trouble lighting the actors without washing out the projections. However, in the second and third acts, when the actor's blocking covered the stage, Kirsten found it very difficult to light without washing out of the projections. After the first cue-to-cue session, I kept going back to the backyard, the office, and the kitchen images and used Photoshop to darken and deepen the floor/ground colours to regain some colour on the deck. I think I rebuilt those images at least three times each in the final days before opening and it did help a little. Kirsten tried to adjust her intensities as well, but after discussing our options, it would have taken moving several lighting instruments, refocusing, and a reset of levels to change it. Time being what it was — that wasn't going to happen. Kirsten did integrate my wish for a "fade to white" at the end of the play — the image kept appearing to me as I was working with the big, white projection surface that was the stage. Saul also agreed that as a final image, the choice was a strong one and kept it in the production.

Access to the Theatre of the Arts itself was also an issue. To start, there was

opposition to installing the set two weeks into the term from one of the three different

instructors who also use the theatre as a classroom. The standard practice in the theatre

had been to start the installation of permanent pieces about four weeks into the term. As

the projections were to be such an integral part of the blocking, as well as the comfort of

the actors simply rehearsing on the rake, I requested the earlier install. A compromise

was eventually reached for an install date at the end of three weeks. Then, after the raked

stage was installed, I had to re-design my projector mounts to maximise the throw

distance of the now resized stage. Access to the theatre to build and size my images was

limited by the aforementioned three other classes, my own teaching schedule, rehearsals,

and my classes at and driving time to York. While most of these time conflicts were

known and scheduled, it still limited my ability to troubleshoot and then finally, tweak

the designs.

Once the actors were working in my initial draft projections — prior to the

lighting install — it became obvious that the costumes were mostly safe from picking up

the floor projections, however the tabletops were a different matter. My initial designs for

the desks in the office were of a cherry wood colour while the colour of the kitchen table

in the last act was yellow-gold linoleum. In rehearsals, the props, skin, and clothing easily

picked up those stronger colours when over top of the table. Both of those table colours

were tinted to reduce the colour issue. Surprisingly to me, those were the only colours

that were muted because of reaction to skin or costume. When the lighting was on during

the technical rehearsals, I attempted to bring back the deeper tones, however Kirsten seemed to miss the tabletops so I had to revert to the muted colours.

By and large, I consider my use of projections in this production a success. The set, in its simplest terms was a unit set (a single setting that could represent a variety of locations) as neither the raked floor nor the rear-projection back wall moved throughout the performance. The props (the tables and chairs) moved to indicate a change of location; however on their own without the projected images, the audience possibly might have never identified the intended locations. Or they might have spent more time trying to understand where the scene was located rather than listening to the text. If I had the opportunity to remount this production in the same space, I would only want to change two aspects of the technology to make it better. Firstly, I would replace the three projectors in the lighting canopy with a single, wide-lens unit. That would have cleared up the two, rather large areas on the stage where at table height, no video could hit. If one could imagine the images beamed from the projectors to be three, large pyramids, or mountains, with the peaks being at their respective lenses or mirrors, and the bases of the three projected mountains meeting precisely on the raked stage, then three feet above the base (in the valley between the mountains) there is no video image. That video "hole" forced the placement of most of the desks/tables into positions where the absence of video image would not be a problem. The only time that I couldn't avoid it was in the restaurant in the first act. In that instance, I hung a single, tightly focused lighting instrument with a colour correction filter to match the white of the video projectors – I couldn't use that narrow swath for any video food, but it did mostly mask the existence of

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the video "hole" for the audience. A change to a single projector would have also allowed a change in the raked stage shape; nonetheless I would have only used part of the image by filling in the front sections of the lower rake with diagonal risers running from the narrower front of the stage to the corners of the mid-stage riser. This would have given more travel room around the restaurant table and Angie's "tent" in the backyard. Secondly, I would ensure that I could afford video dowsers so that at the ends of scenes, the stage could go truly black.

The major recommendation I would pass on to people who are considering including projections/media into a production is to have them clearly articulate the answers to the following thirteen questions. These questions were gleaned from a meeting with Ben Chaisson and Beth Kates, principals of maph productions (sic) and Playground Studios — corporate and theatrical media designers. In my prioritized order:

1. Does this project need it?
2. What is the style and creative vision of the piece?
3. Is there an expectation of other designers to have input on the projection design?
4. What is the budget? How much for system versus how much for content?
5. What is the content for the production?
6. Will I need/get help to find/create the show content?
7. Where are you performing?
8. Will there be a live feed?
9. How do I get content to the stage?
10. How big an area are you covering with your projections?
11. What are you projecting onto?
12. How many projectors are required?
13. Where do your displays go?

Most of these questions have to be answered between the projection designer, the director, the set designer, the technical director, and producer. Once artistic and budget

choices are made, the system design — or the gear and software needed to run the media — needs to be created. As far as technology goes, the initial choice has to be made between Mac and PC. Mac appears to be a more stable platform with many more professional applications available for content creation, manipulation, and playback. It would seem that except for the Adobe suite, there aren't as many well-known applications for PC. The PC benefits are in freeware and inexpensive choices that may not be as robust, but certainly capable to get the job completed. Adobe Photoshop, or Elements, along with Illustrator, are perfect for content creation — especially for those with access to educational pricing. Those same Adobe applications are available on PC; however programs such as Gimp are available cross-platform (written for PC, Mac, Linux and occasionally other operating systems) are open-sourced and that allows the application to be easily and quickly improved with every version.

For playback, the options are quite varied. I couldn't find any freeware for Mac, although Qlab does have inexpensive rental licenses starting around $5 per day and the full professional video license is $399 USD. Isadora, at $275 USD with an academic discount, isn't incredibly expensive for a playback software program, but its programming graphical interface using "strings" to connect the video flow and process isn't quite intuitive for many people. The last major software-based solution for playback is called Watchout and is incredibly robust and effective solution. However at a minimum cost of just under $10,000 USD for a three projector system plus a computer required to drive each of the projectors along with a programming computer, that system is certainly out of reach for most small companies. There are also hardware-based video server

solutions such as Hippotizer and Catalyst that are driven by high-end lighting control boards, but they tend to start in the $20,000 USD range even before the control surface gets added in. Overall, the budget and time will always be the limiting factors when including media into live performance.

To conclude, I am very happy with my projections as they did what they needed to do (albeit with less intensity owing to the lighting needs). I am also very happy with my video spike marks as they allowed the actors and the stage crew to place the tables precisely during the scene changes and ensure that the projections were hitting what was required. The same spike marks were used on the restaurant table for the waitress to make certain that the food landed on the plates and not the tablecloth. But the main reason I chose this play for my MFA thesis was to challenge myself in costume design. I had never done it before and I wanted to test myself. It is a little scary to think that 1982 is now a period production and then added to that, the other millennia of costumes in the first act to be designed. I am very happy with the final result.

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Act / Sc / Page	Cast	Set	Props	Costumes	Lighting	Sound	Special Effects	Special Notes
I.1a p.11	Marlene Waitress Isabella Bird Lady Nijo Dull Gret Pope Joan	A restaurant	-Table(s) -6 chairs -Tablecloth -6 settings -6 wine glasses -Bread in basket -Notebook for Waitress -Btle of Frascati -5 menus -More bread -Soup/salad bowls/plates -6 Plates (Gret steals one) -2 more bottles (Gret steals one) -2 more bottles (Gret steals another one)	Gret - apron	Saturday night int.			Isabella – chicken & soup Nijo – Waldorf salad Marlene – Avocado vinaigrette, Steak & potatoes Gret – Soup, Steak & potatoes Joan – Cannelloni & salad
I.1b p. 30	Marlene Waitress Isabella Bird Lady Nijo Dull Gret Pope Joan Griselda		-Desert menus -6 coffees -Creamer -Sugar bowl -6 double brandies -Brandy bottle -Glass of water		Cont.			Marlene – Profiteroles Joan – Zabagilione Isabella – Apple pie & cream Nijo – Zabagilione Gret – Cake Griselda - Cheese & biscuits
I.2 p. 41	Marlene Jeanine	Top Girls Employment	-Desk -2 chairs		Monday morning int.			

Act / Sc / Page	Cast	Set	Props	Costumes	Lighting	Sound	Special Effects	Special Notes
		Agency	-File folder -Transcript					
I.3 p 45	Joyce Angie (16) Kit (12)	Backyard US. door to house	-Shelter made of junk -brick	Changes into an old best dress that's too small for her	Sunday afternoon ext. Starts to rain	rain	Kit puts hand under own dress – shows bloody finger, Angie licks it	Angie twists Kit's arm
II.1a p. 56	Nell Win Marlene	Top Girls Employment Agency -main office	-3 desks w/chairs -2 Coffee cups -sugar packets		Monday morning int.			
II.1b p. 61	Win Louise	-interview area	-Desk -2 chairs -File folder		Cont.			
II.1c p. 64	Marlene Angie	-main office	-3 desks w/chairs					
II.1d p. 68	Marlene Angie Mrs. Kidd	Cont.	same					
II.1e p. 71	(Angie) Nell Shona	-interview area	-Desk -2 chairs -File folder					

Act / Sc / Page	Cast	Set	Props	Costumes	Lighting	Sound	Special Effects	Special Notes
II.1f p. 74	Marlene Angie Nell Win	-main office	-3 desks w/chairs -yoghurt -spoon					
II.2a p. 77	Marlene Joyce Angie	Joyce's kitchen	-kitchen table -3 chairs -carrier bag -presents: -box of chocolates -dress from Act 1 -perfume -Tea cup -Sugar bowl w/spoon	Angie returns wearing dress from Act 1 – it fits her this time	Sunday evening			
II.2b p. 82	Marlene Joyce Angie Kit	cont.	-bottle of whiskey -2 glasses -post card of Grand Canyon					
II.2c p. 88	Marlene Joyce Angie	cont.	-Tea fixings -blanket					

Appendix B – Set renderings
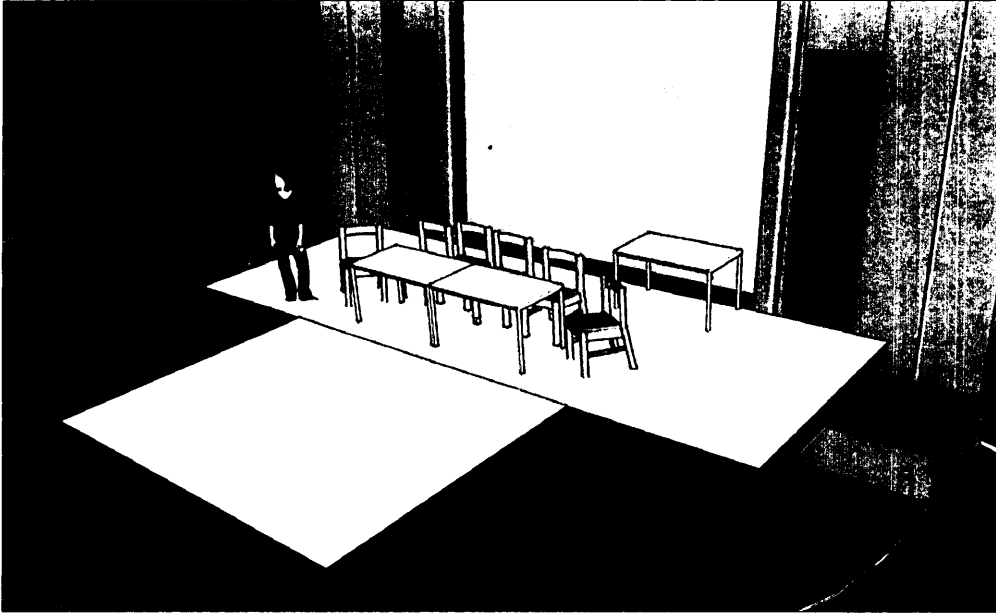
Act I – The Restaurant
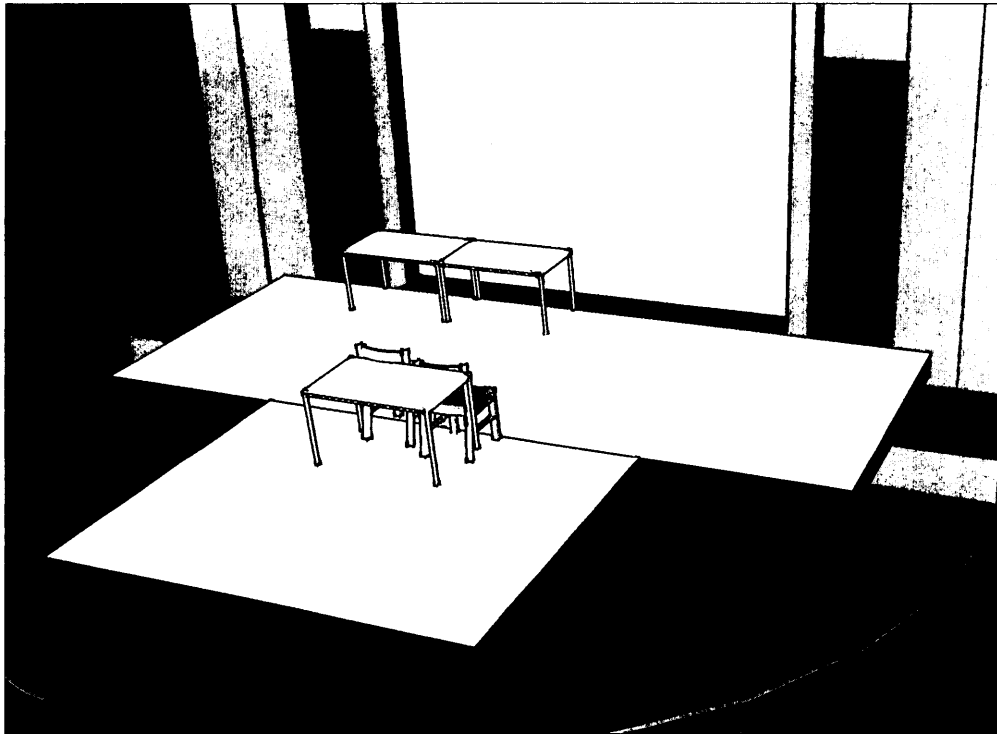
Act II – The Backyard
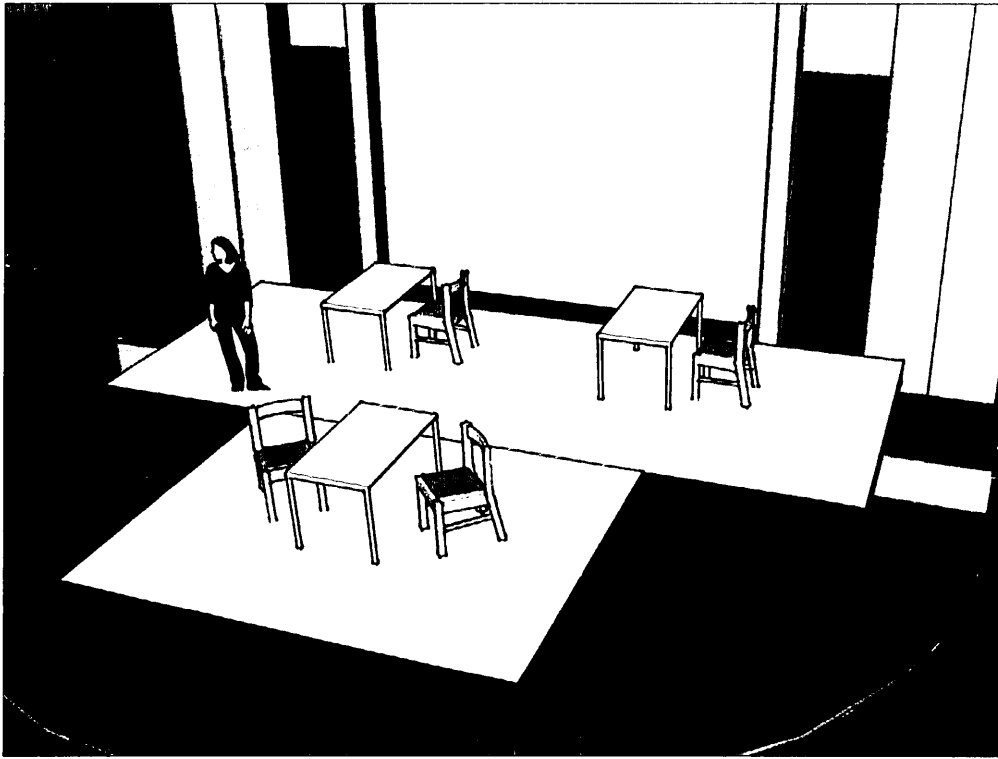
Act II – The Office
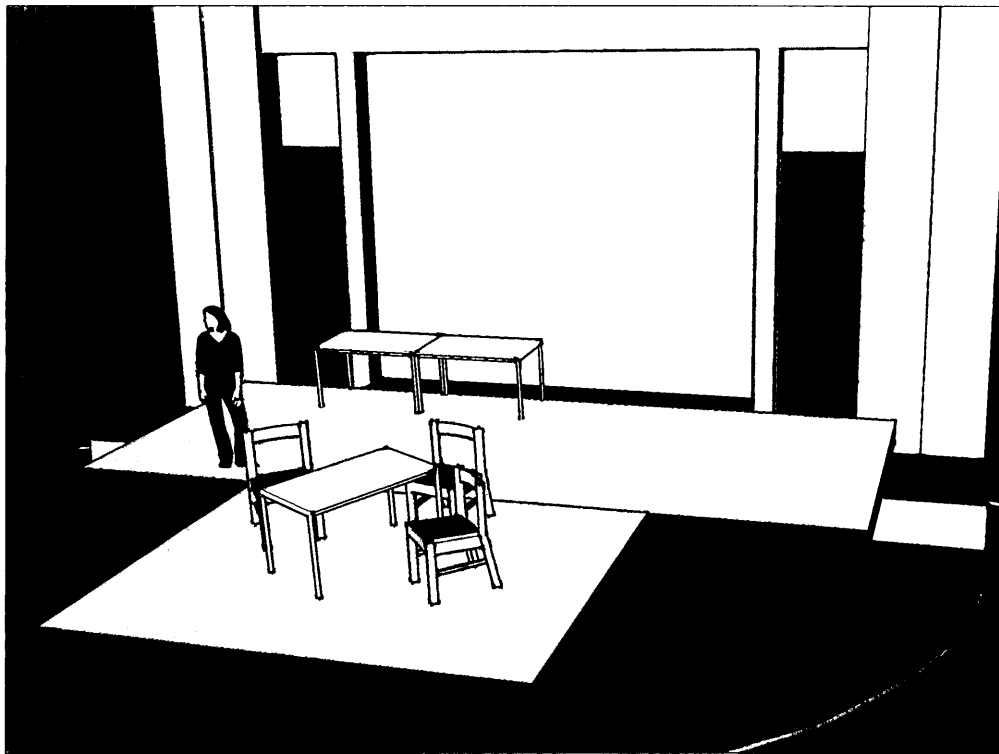
Act III – The Kitchen

51

Appendix C – Projection Drafts
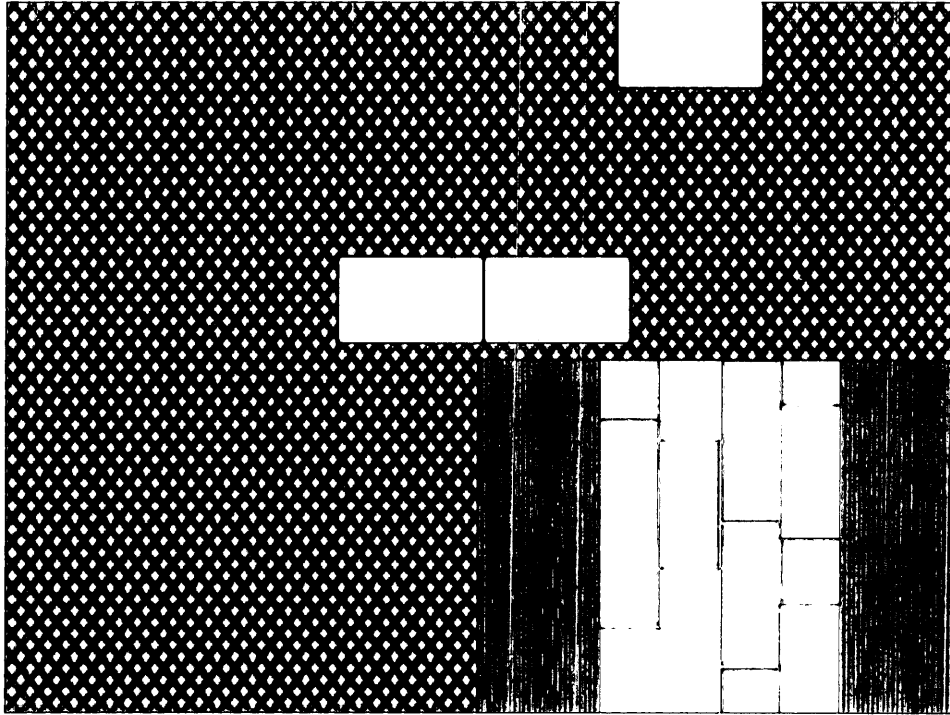
Restaurant floor and rear wall
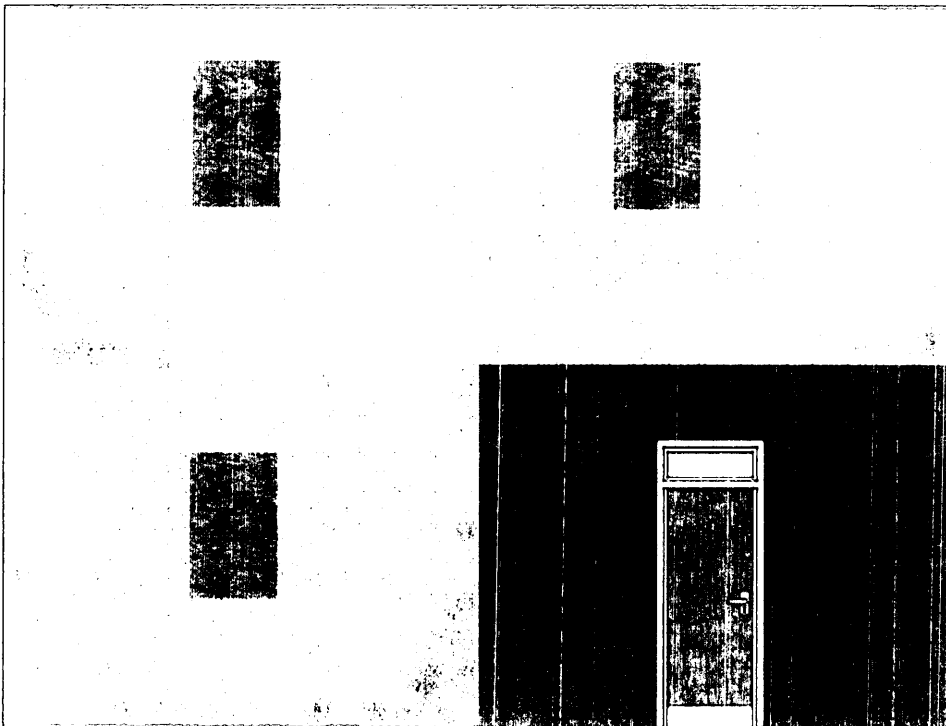
Office floor and wall
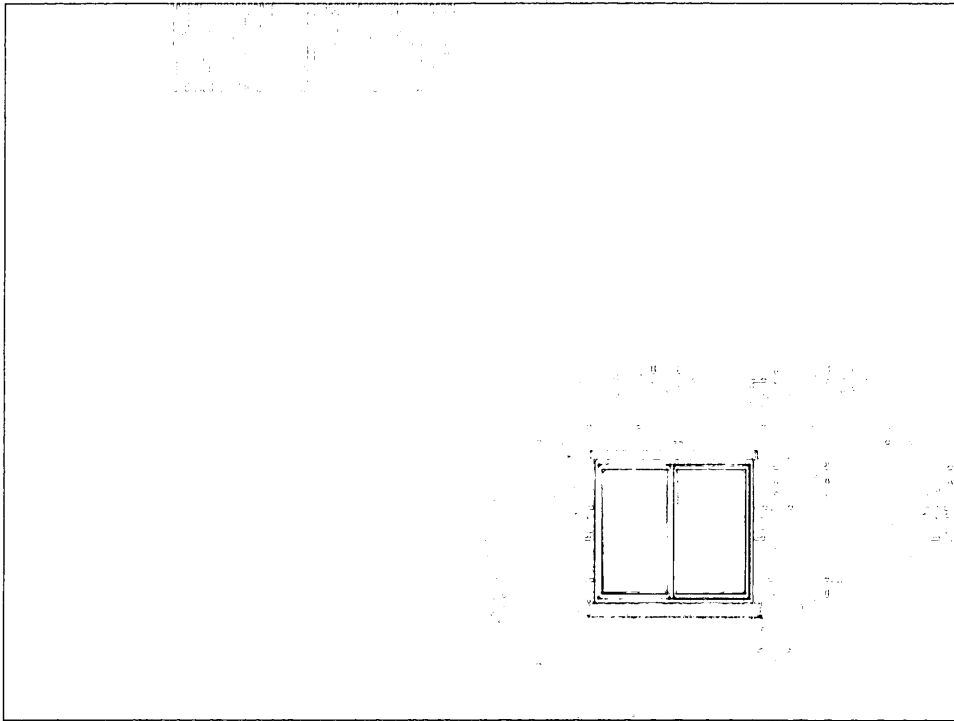
Backyard and house wall
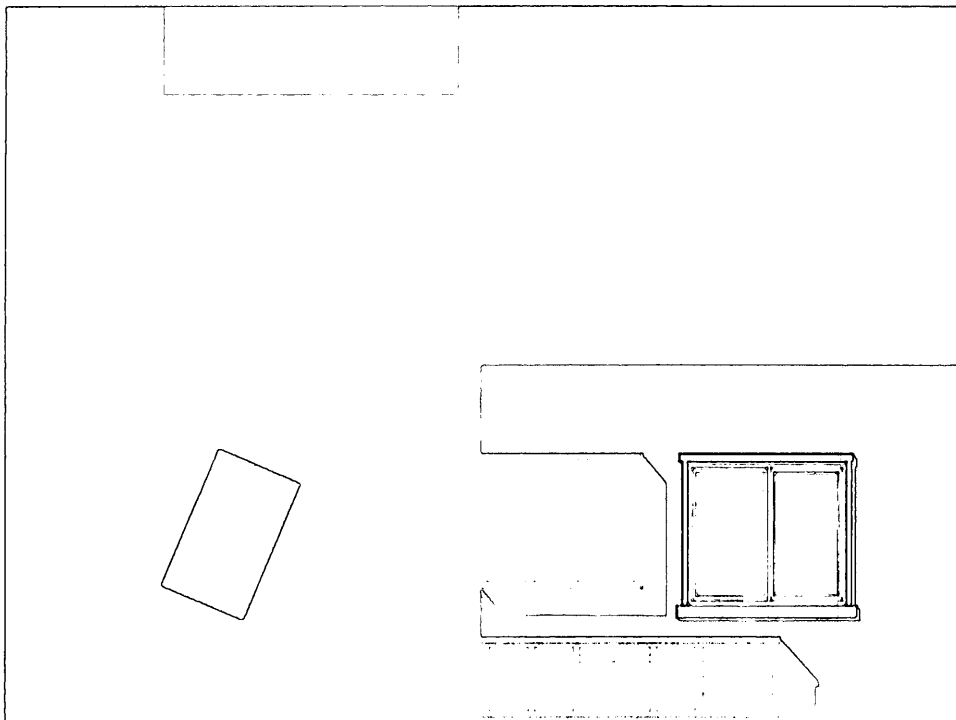
Kitchen floor and wall

Appendix D - Costume Renderings

Marlene

Top Girls - UW Drama
March 2013
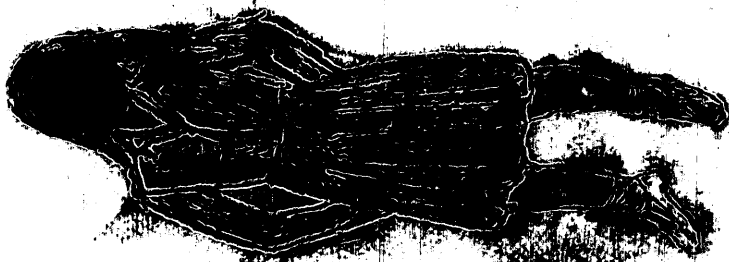
Angie
Act II
sc 3c

Angie
Act II
sc 3c

Scott Sanem

Isabella, Angie

Joan, Joyce

Scott Spidell

Joyce III.a

Joyce III.2

Top Girls - UNO Drama
March 2013
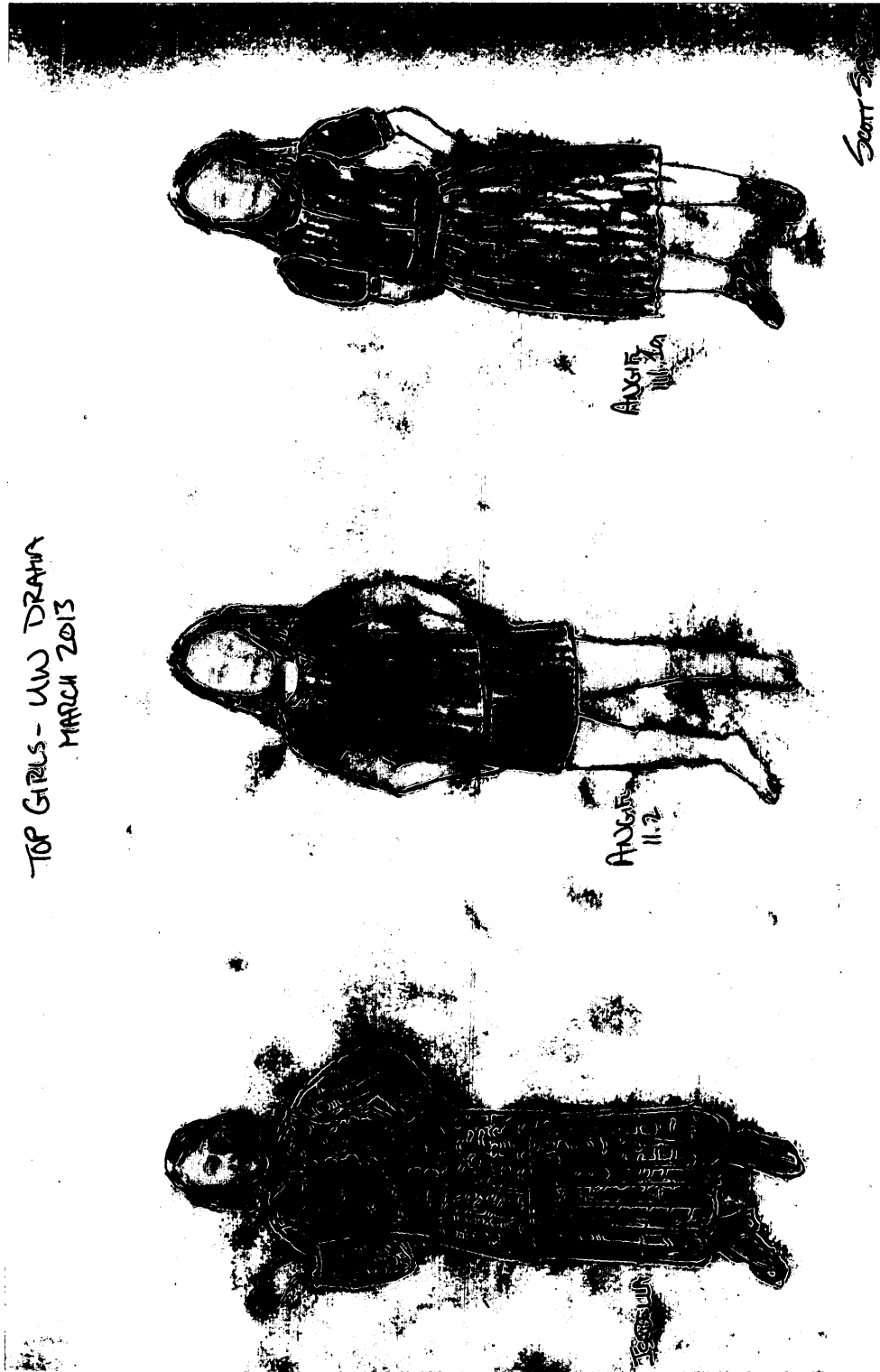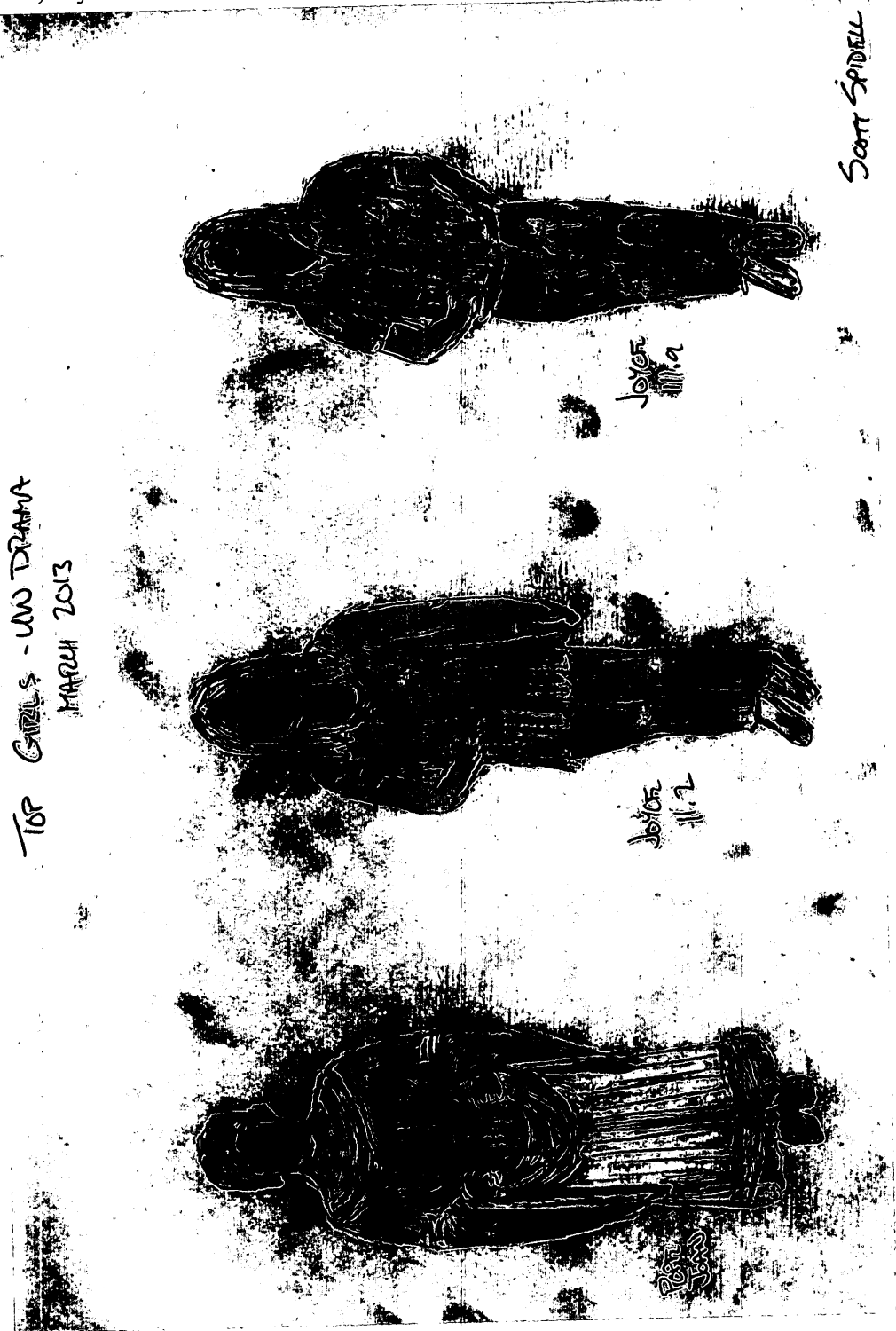
Waitress, Jeanine, Win

TOP GIRLS -UW DRAMA
MARCH 2013

WIN
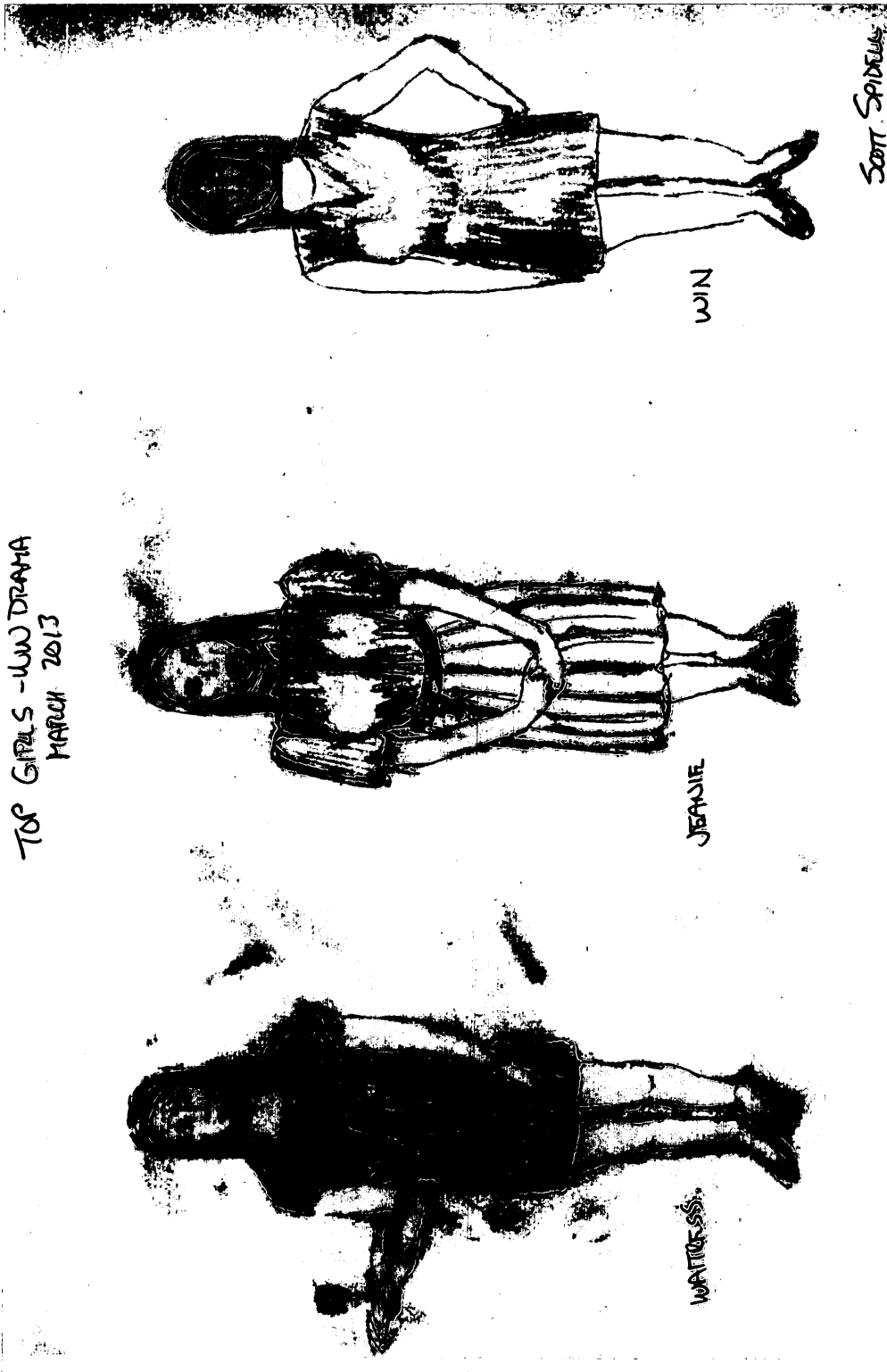
SCOTT SPIDELL

JEANIE

WAITRESS

Gret, Nell, Louise
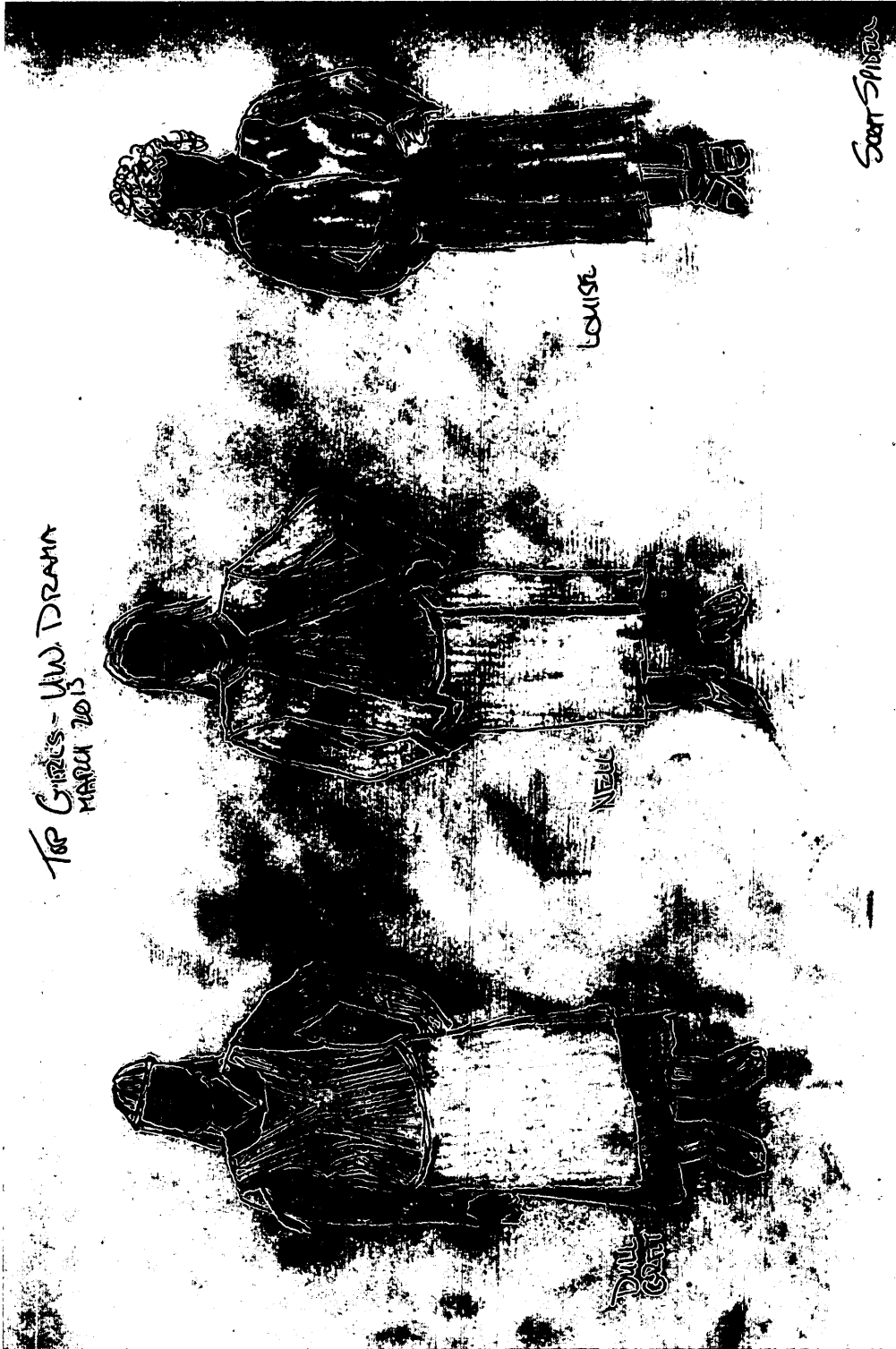
Nijo, Mrs Kidd, Shona

Griselda, Kit
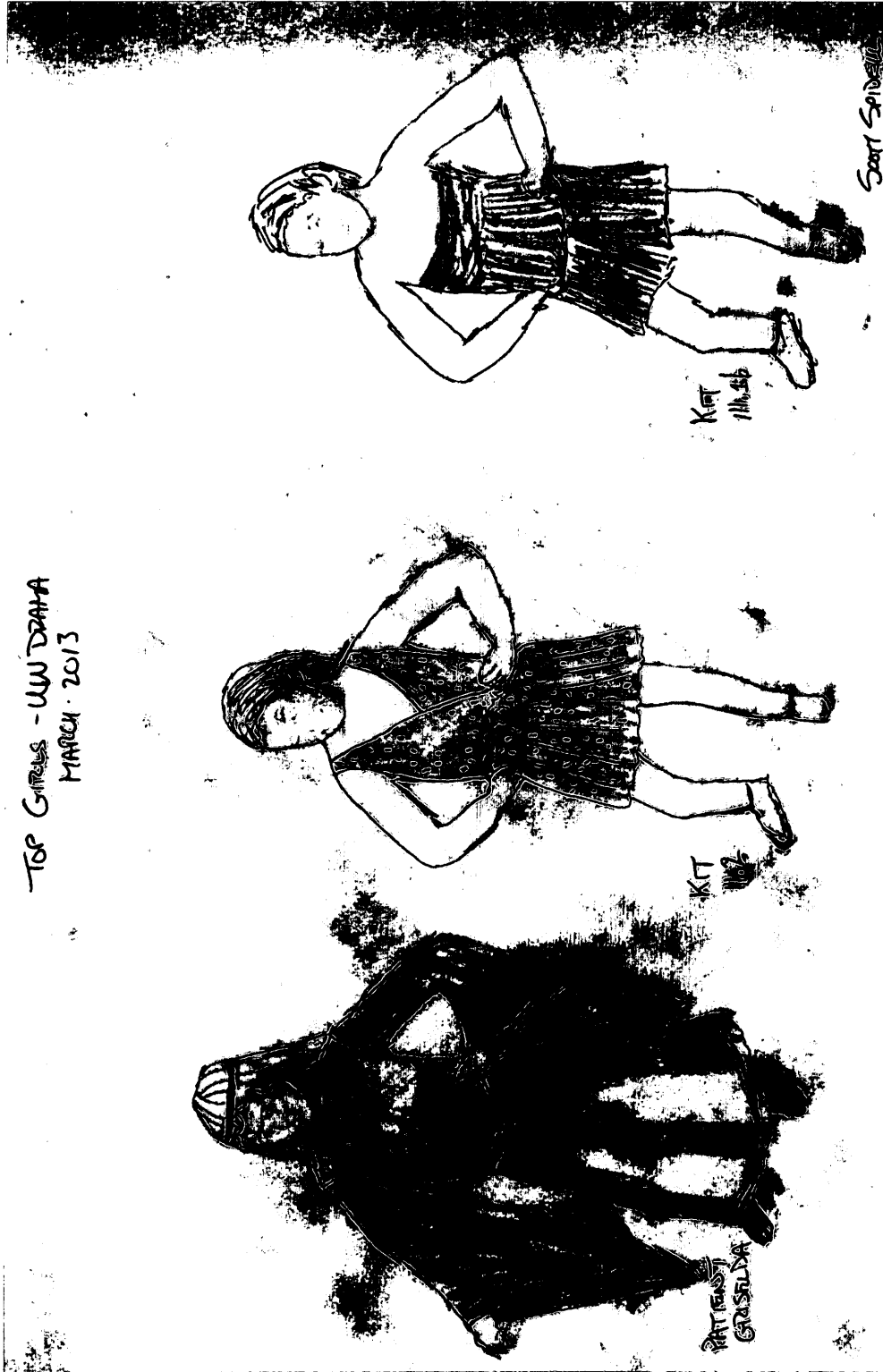
Character	Scene	Pieces	Notes	Pull	Alt	Bld	Buy
Marlene	Act I	dark blue jacket and slacks wool	possibly pinstripe - jacket to hip		X		X
Cassandra Cline		belt		X			X
		sensible blue or black heel		X			X
		blouse of similar colour			X		.X
		watch - gold face and band		X			X
		earrings - gold studs		X			X
		hair cut- just above shoulder					
	Act II	navy dress	fabric flows, possibly gold belt		X	X	X
		red jacket applique or embroidery	polyester matte finish		X		X
		necklace - gold		X			X
		watch - gold		X			X
		earrings - gold dangly		X			X
		black heels	with red?	X			X
	Act III	lighter blue jacket and slacks -linen?	Blue linen or light weight suiting		X		X
		loafers	possibly tan	X			X
		necklace - gold		X			X
		watch - gold		X			X
		earrings - gold studs		X			X
Joyce	Act II	jeans - high waist			X		X
Andreea Hluscu		red/orange t-shirt - baggy	un-tucked, maybe it has a scalloped edge		X		X
		runners	Pumas, Adidas, a trainer style				X
		simple watch - black strap		X			X
		no jewelery					
		hair-					
	Act III	same jeans					
		green golf shirt	deep cool blue green tucked in	X	X		X
		brown belt- leather		X			X
		brown flat shoes	possibly a dark brown desert boot	X			X
		simple watch - black strap		X			X
		hair tied back					

Character	Scene	Pieces	Notes	Pull	Alt	Bld	Buy
Angie	Act II 2	red T shirt					X
Meghan Jones		blue jean skirt			X		X
		barefoot					
		hair					
	Act II 3a	"old" or ill fitting blue dress				X	
	Act II 3c	london traveller					
		Blue cardigan		X	X		X
		red, collared golf shirt		X			X
		Light coloured, narrow jeans		X	X		X
		Runners		X			X
		hair- not tidied up					
	Act III 1a	Same as above w/ rust t-shirt		X	X		X
	Act III 2	Blue dress				X	
	Act III 3	nightgown		X			X
Kit	Act II 2	yellow print romper dress			X	X	X
Carleigh MacDonald		white Keds runners					X
		hair-					
	Act III 1	teal green play suit			X	X	X
		same shoes					
Griselda	Act I	white sleeve attached in blue cotton/				X	X
Carleigh MacDonald		linen dress with cord belt		X			
		white veil with blue cord				X	
		hair-under veil and we don't see					

Character	Scene	Pieces	Notes	Pull	Alt	Bld	Buy
Isabella Bird	Act I	tweed travelling jacket and skirt	possibly camisole or T shirt underneath ?			X	
Meghan Jones		paddock riding boots		X			X
		peaked cap with scarf attached				X	X
		possibly brown leather gloves ?					X
		hair under hat and hidden by scarf?					
Pope Joan	Act I	white alb with design borders		X			
Andree Hluscu		red velvet mantum with ivory piping		X			
		red velvet skull cap with ivory piping		X			
		oxblood red slippers Romeo style		X			X
		possibly a gold ring		X			X
		hair- tucked inside skull cap					
Waitress	Act I	sexy "little" black dress V neck			X		X
Jennifer Gooderham		black 1" heel patent or leather shoes	Closed toe shoe	X			X
		black strap watch or all silver watch		X			X
		hair - tied back					
Jeanine	Act I 2	cornflower blue print blouse	country style			X	X
Jennifer Gooderham		cream or ivory skirt	solid colour, texture fabric in cotton family	X	X		X
		fabric sash -contrasting fuchsia				X	
		silver bangle bracelet		X			X
		1" low heel blue shoe		X			X
		hair loose					
Win	Act 2 I	coral shift dress- crepe silk rayon		X			X
Jennifer Gooderham		2" heel most fashionable pump	same colour of dress or white	X			X
		big white clip on earrings with		X			X
		matching white bangle		X			X
		hair worn up					

Character	Scene	Pieces	Notes	Pull	Alt	Bld	Buy
Dull Gret	Act I	off white apron w bib and big pockets				X	
Sydney Spidell		leather bowl helmet		X			
		long sleeve cotton shirt		X	X		X
		dark grey coarse wool top		X			
		dark grey coarse wool skirt		X			
		black leggings		X			X
		short boots with putties		X		X	X
		leather gauntlet with metal cuff		X			
		armour breast plate		X			
		hair- under helm and back					
Nell	Act 2 I	ivory or camel jacket and skirt		X			X
Sydney Spidell		dark blouse with V neck and tie		X			X
		matching shoes - pump		X			X
		silver watch, silver earrings		X			X
		hair pulled back w clip					
Louise	Act 2 I	beige/brown print shirt dress C1975		X			X
Andreea Hluscu		red sandals		X			X
		clip on earrings - colour		X			X
		wedding ring		X			X
		grey wig		X			
Lady Nijo	Act I	olive green Kimono		X			
Michelle Kestle		red silk zukin		X		X	
		black slippers		X			X
		hair- hidden under zukin					
Mrs. Kidd	Act 2 I	late 70's Sunday best dress drab print		X			X
Michelle Kestle		matching purse		X			X
		low heel pump matches purse		X			X
		earrings, wedding band		X			X
		hair-					

Character	Scene	Pieces	Notes	Pull	Alt	Bld	Buy
Shona	Act 2 I	red V neck fine knit sweater		X			X
Carleigh MacDonald		black sheen slacks					X
		tallest heel 3" black pump		X			X
		soft leather gold metallic belt		X		X	X
		gold earrings, wide gold bangle		X			X
		hair-					

Appendix F: Process Documentation

What follows are scans of my notes from my research on switching projectors, redesigning the projector mounts, Datapath math, and notes taken during technical rehearsals and runs. Following that, I've included photographs of the two sizes of projector mounts that I designed and built. And finally, images of the costume designs beside the finished pieces as well as fabric swatches of the costume pieces that were built.

Projector Central Calculator test using the existing theatre projector with a new lens

LX 700
w .8 fixed lens   38·809049-51

7" from mirror for 8"↑ image
max throw ~ 19'6' + 7" = 20'·1"

Heather Jennifer
519-743-6113
Christie   LX 700
w. .8 fixed
Lisa Nicole 38-809049
-51
LW 650 2'8"
lens - 0.5-0.6:1 with short lens
P.N. 121-104106-XX

Notes on trying to find and price a different model and lens

68

NEED 18'8"

FROM HIGH TO GRID ^15'.9"

BACK   14'.1"   MIRRORS 3'3/4 x 8 1/2"

Back   5' - throw horizontal   Max throw 1/23'
Front 4' - throw horizontal

BACK   FROM FURTHER DS = 1'.3" + 15'.3" = 16'.8"
       by lifting projector 8" above pipe 1'.3" + 15'.10" = 17'.1"

FRONT   8" ABOVE PIPE = 1'.3" + 16'.1" = 17'.4"

largest image is 9'3" high @ 2'8"

26' - 312   18'.6" ÷ 6" = 79
x19'.5" 234
                   .8 = 24" x 18'.10"

Christie LW650 w/ 0.5-0.6:1 lens   121-104106-xx
$18K

HITACHI CP-WX11000

Math from building the larger mirror projector mounts

69

Math for the Datapath x4 layout

STRANGE SHADOW RESTAURANT — BARNDOOR!

SERVE FROM RIGHT — REMOVE FROM LEFT

NO STACKED PLATES

— REMOVE TRAY BOTH SIDES

FATHER?

WARNING POSTER — LANGUAGE SITUATIONS

DUST ON PROSC

Less vocal pitch

both sides — POUC !!

FORKS + FOLDERS

SUGAR PACKETS —

PAPERS SLIPPING (THE LOWER?)

LIGHTS ON DESKS

SIDE OF FLAT

Store is under water

SHIM the left

get under counter —

too upstage Anthuel shoes / silk

distracts.

candy cups? w/ slow patch

wool blanket
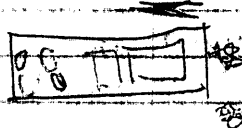
Notes from first tech run

71
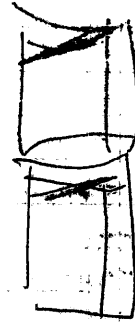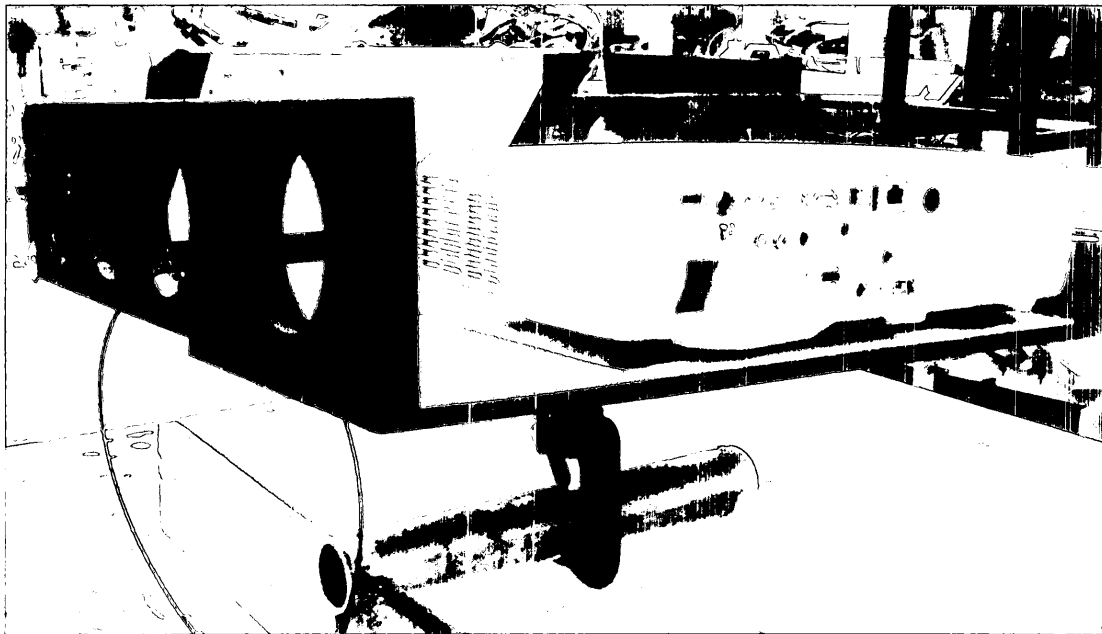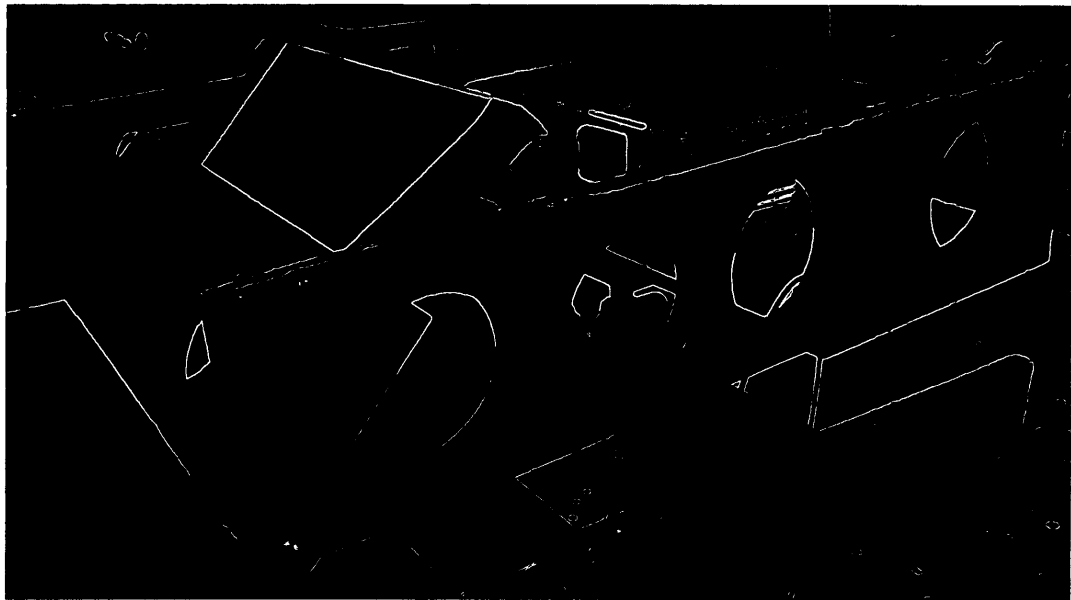
GASS ~~BOOST~~ over 5?
~~N@O FELL 2 SKIN~~
~~ISSY JACKET ??? 2" ?~~
~~FOOD OUT LATE - STARVING~~
hair ~~band for waitress~~ ? ELASTIC/PONY.
~~GRIT VEIL~~ "TOO FAR BACK?
~~APPS ??? to RESTAURANT OUT~~
~~~~~~DRAWER.~~~~~~   BRICK
      DARKER EDGES - LESS ON/WALL .
~~turn ring around MRS KIDD)~~
~~GASS PEN~~ !
~~SHANA SIT UP?~~
~~Couple of plates + extra cups + dish rack~~
      ~~rack closer to sink~~   /

MUSIC ?
~~BUN~~ BUILDUP TIME
GRIT - DARKER DIRT   46
    redo yard dirt   47
NOISE BACKSTAGE ! ACT II   55
FORMS?
Sydney collar
PEN ! !
water in kettle /corner.
have my bed - not tonight
last one too early

Notes from first technical rehearsal with costumes

Notes from Tech Dress

73

REFOCUS ALL ~~TABLES~~

RESTAURANT - SL EDGE
    - TABLE SHIFT

~~BLACK TAPE ON PROJECTORS~~
        ~~OLD POSTER~~

Tobacco stain for Gret?

~~Adjust Front Projector~~

FROSTED MARTINI OR CHAMPAGNE

TENT - DARKER
VIDEO MONITOR FOR ERIC?

~~Tech booth OT sz.~~

~~SL Box~~? 50° -

TONE DOWN ~~FLOOR~~ IN KITCHEN MARK

~~SFX~~ ~~IN BUMPS~~ ~~TAP BREAD BASKETS~~

WINE + BRANDY GLASSES

    ~~EXIT~~

~~get rid of front row's seats SR~~

COFFEE! have my my bed

re to the little woman

Notes from Dress Rehearsal

Original, small mirror projector mount, only downstage version stayed

Small mirror projector mount from below

Large mirror projector mount used for both upstage positions

Large mirror projector mount – other views

Cassandra Cline – Marlene Act 1

Cassandra Cline – Marlene Act 2

Cassandra Cline – Marlene Act 3

Meghan Jones – Angie Act 3

Meghan Jones – Angie Act 3 and Act 2 respectively

Swatches for Isabella Bird suit and Angie blue dress

Meghan Jones – Isabella Bird Act 1

Meghan Jones – Angie Act 3

Meghan Jones – Angie Act 2

Andreea Hluscu – Joyce Act 2

Andreea Hluscu – Pope Joan Act 1

Andreea Hluscu
Pope Joan
skull cap
Fabricland Stratford
$18''/yard
½ yard
Feb 12ᵗʰ   42''
             wide

Andreea Hluscu
Pope Joan
shirt
Fabricland Statford
$4''/yard
4.35 metres
Feb 12ᵗʰ   58''
             wide

Fabric swatches for Pope Joan skull cap and shirt

Andreea Hluscu – Joyce Act 3

Jennifer Gooderham – Waitress Act 1

Jennifer Gooderham – Jeanine Act 2

Jennifer Gooderham
Jeanine
cornflower blue blouse
Lens Mill Guelph.
$10⁹⁹ /metre
3 m
Feb 2ⁿᵈ   42" wide

Jennifer Gooderham
Jeanine
sash
Lens Mill Guelph
$9⁹⁹ /metre
3/4 metre
Feb 2ⁿᵈ   58" wide

Fabric swatches for Jeanine – blouse and sash

Jennifer Gooderham – Win Act 2

Fabric swatches Win – dress and lining

Sydney Spidell – Dull Gret Act 1

Sydney Spidell
Dull Gret
Apron
Lens Mill Guelph
$6⁰⁰/yard
2½ yards
Feb 2ⁿᵈ   55" wide

Andreea Ilisiu
Pope Joan
skull cap
Fabricland Stratford
$4⁰⁰/yard (50% off)
3 yards   54" wide.
Feb 12ᵗʰ

Fabric swatches – Gret apron & Pope Joan cap lining

Sydney Spidell – Nell Act 2

Andreea Hluscu – Louise Act 2

Michelle Kestle – Lady Nijo Act 1

Michelle Kestle – Mrs Kidd Act 2

Carleigh MacDonald – Shona Act 2

Fabric swatches – Shona belt & Griselda veil

Carleigh MacDonald – Griselda Act 1

Carleigh MacDonald – Kit Act 2

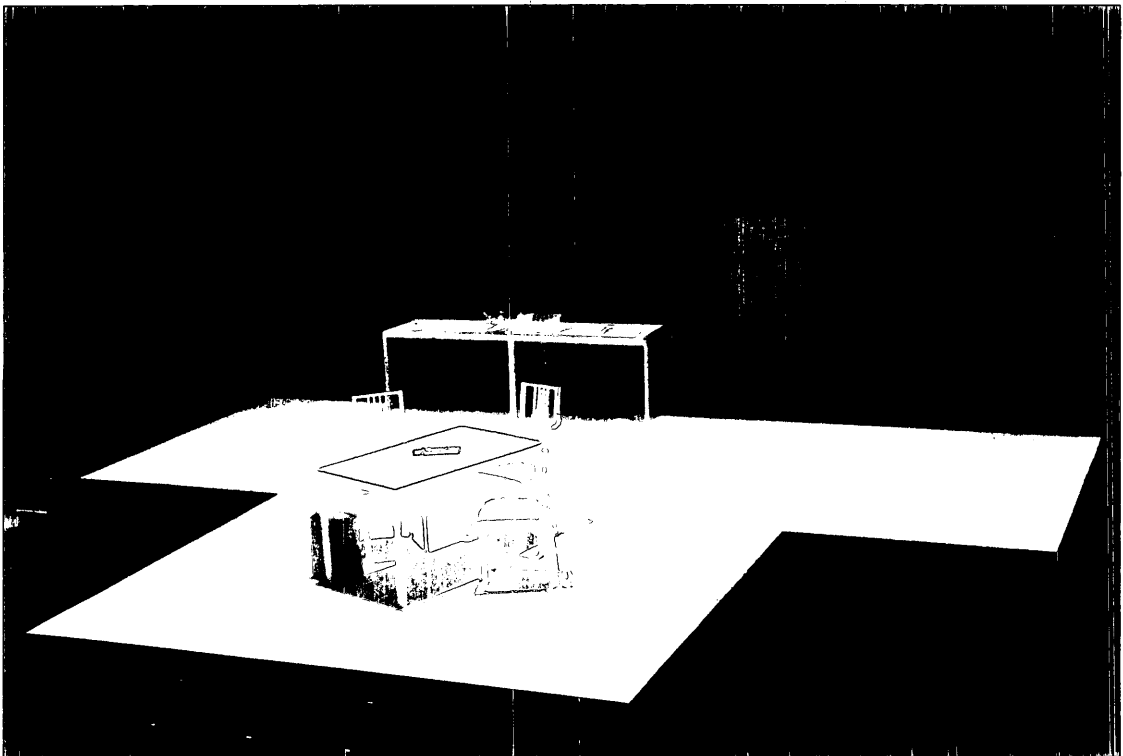Carleigh MacDonald – Kit Act 3

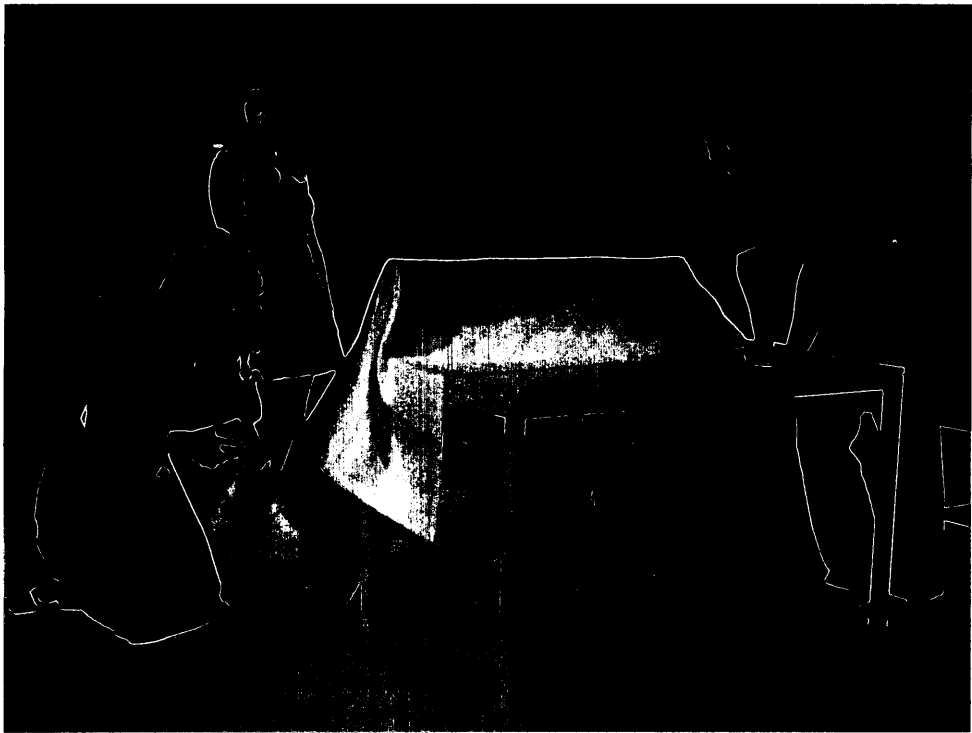Fabric swatches Kit Act 2 & Act 3

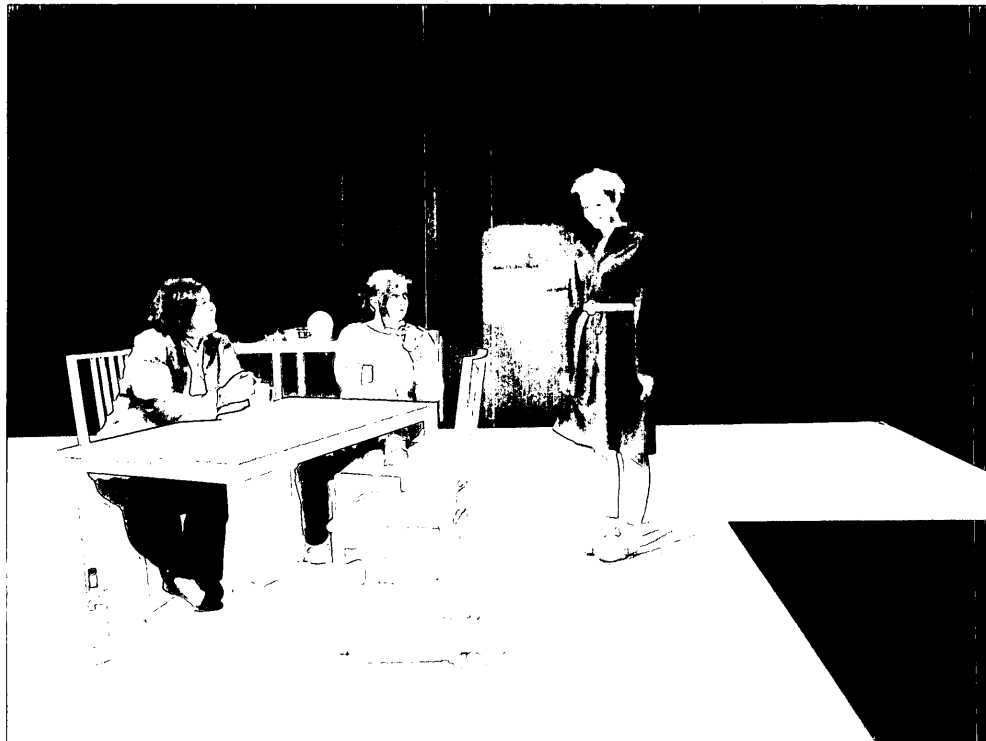Act 1

Act 2 scene i

Act 2 scene ii

Act 3

Act 1 – Full Cast

Act 2 scene i – Meghan Jones, Carleigh MacDonald, Andreea Hluscu

Act 2 scene ii – Cassandra Cline, Sydney Spidell, Jennifer Gooderham

Act 3 – Cassandra Cline, Andreea Hluscu, Meghan Jones